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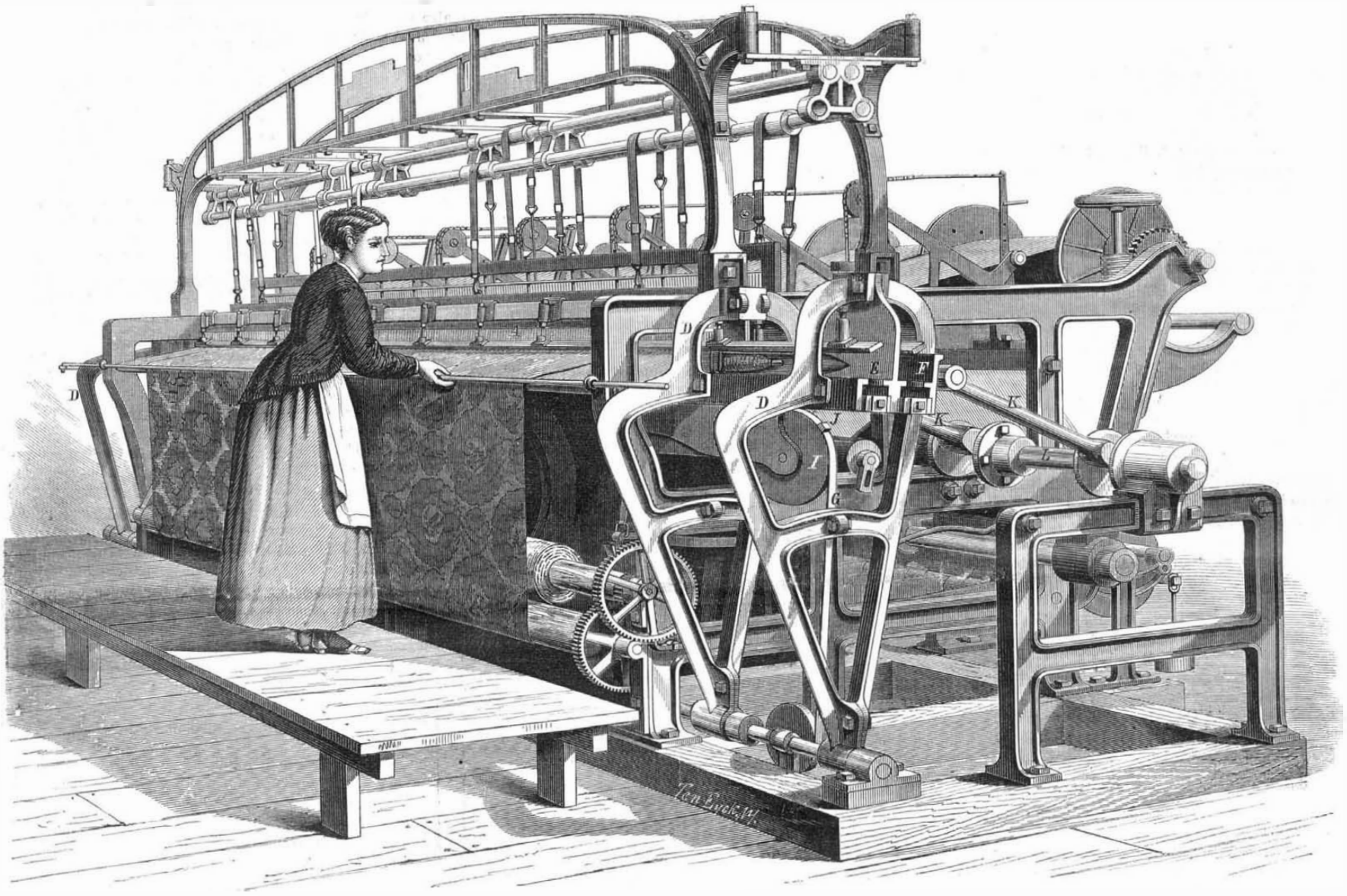
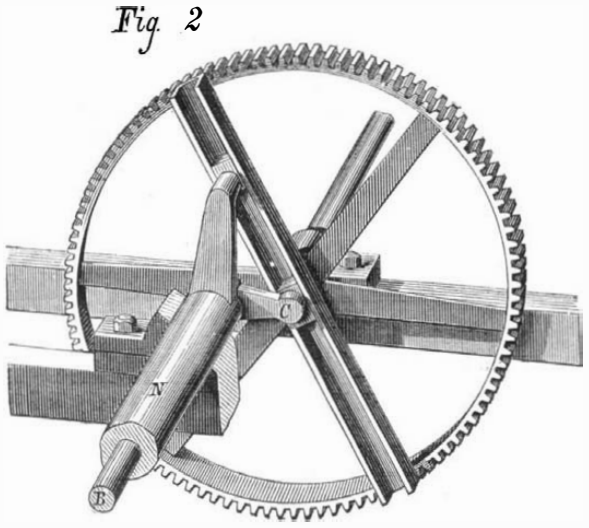
LOOM FOR WEAVING FABRICS OF ANY WIDTH.

We take pleasure in laying before our readers a device which, for ingenuity of construction, for excellence of design, and for the highly valuable results obtained by its use, may justly take rank among the remarkable inventions of modern times. Though its many parts, at first inspection appearing complex, in the end prove of admirable simplicity, it is nevertheless almost impossible to render full justice to the merits of the machine by the ordinary means. Words of description, though accompanied by never so good illustrations, fail to convey the ideas to which a few moment's study of the actual device, in its almost life-like motion, will give rise.



SHORT'S LOOM FOR WEAVING FABRICS OF ANY WIDTH.

Fig. 2

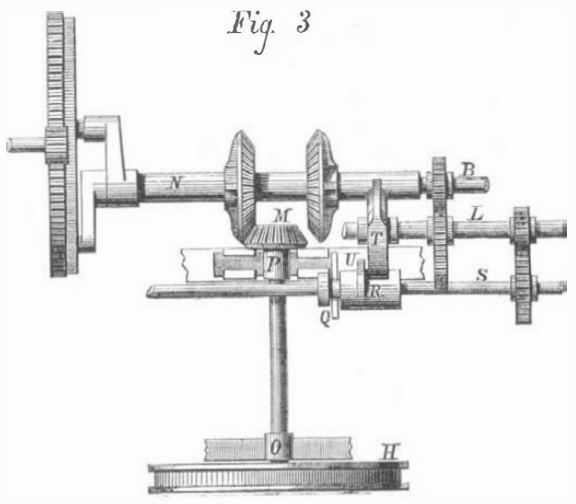


A glance at the engravings has doubtless already shown that the invention is a loom, and from the same source the observing reader has probably divined its capabilities. In brief, it will weave carpets, shawls, cloth, or any coarse fabric of any style, pattern, or device, and of any width; to exemplify, it will produce the floor covering of an entire room, large or small, in a single piece and without a seam, as readily, as cheaply, and far more expeditiously than if the carpet were made in ordinary breadth to be fitted to the apartment. Such is its work; it remains for us to convey to the reader how it is performed.

The large and, we may with truth add, excellent engraving conveys a correct idea of the general appearance of the machine, which somewhat resembles a well known positive loom already in the market; more especially as its motion is essentially positive. As is necessary for a clear explanation, we enter upon the description of the various parts in detail, beginning with the motion of the shuttle race, A, which is so vibrated forward and back as to serve the purpose of a lay or batten. The shaft causing this motion is, by the interposition of suitable mechanism, connected to the revolving shaft, B, in Fig. 2, at the outer end of which is a crank, C, which has its wristpin fitted in a slot or groove of the large gear wheel, to which motion is imparted by the main pulley. The center of this gear wheel is so far eccentric to the axis of the shaft, B, that the crank, C, may nearly, but not quite, reach the center of the wheel, the slot or groove, as shown, extending diametrically across the face of the latter. The motion thus imparted to the revolving shaft, B, is not uniform, as the crank, C, when in the outer part of the slot, turns much quicker than when in the inner part or center of the same. Consequently the shaft, B, performs part of its revolution very rapidly, and the outer portion so slowly as to be almost stationary. By this arrangement, the interposing mechanism is so actuated that the batten, A, is first moved quickly forward, then back to lay the thread, then to return, and finally to remain at rest to allow of the motion of the shuttle.

The most prominent portions of the large engraving are the triangular shaped frames, D D, which are pivoted, as shown, at their lower ends and at either extremity of the loom. These frames contain, in their upper portion, two channels, E and F, of the same form in cross section as the shuttle guide in the batten. It is plain that by moving the frames, D D, either of these channels may be placed at the extremity of the batten, A, so as to form a continuation or elongation of the same. Before proceeding further into the mechanism of the frames, D D, it is necessary to understand the movement of the shuttle belt, a portion of which is shown at G, in the engraving. This band serves to convey the shuttles and carriers over, or rather through, the raceway, within which it is supported on small friction rollers, and moves with the raceway when the latter is swung, as before described, as a batten. Motion is communicated to the belt by passing it over an operating drum, H, Fig. 3, situated under the front middle portion of the loom, and not shown in Fig. 1. At I, Fig. 1, is represented one of the rollers situated underneath the channels of the frames, D D, over which the belt passes downward. The number of shuttles and carriers used at any one period is one less than the combined number of channels in the frames. Thus if each end frame has two channels, as shown in the engraving, as there are four in all, three shuttle carriers and shuttles can be used. The connection between the shuttle belt, G, and the shuttle carrier is

Fig. 3



effected by means of a lug, J, Fig. 1, on the upper part of the former, which fits into a corresponding mortise in the under side of the carrier. After being transported the length of its race, the shuttle is left in one of the channels of the frames, D D, when the lug, J, leaves the mortise in the carrier, the belt passing down over the roller, as before stated. Meanwhile another lug on the shuttle band engages another car

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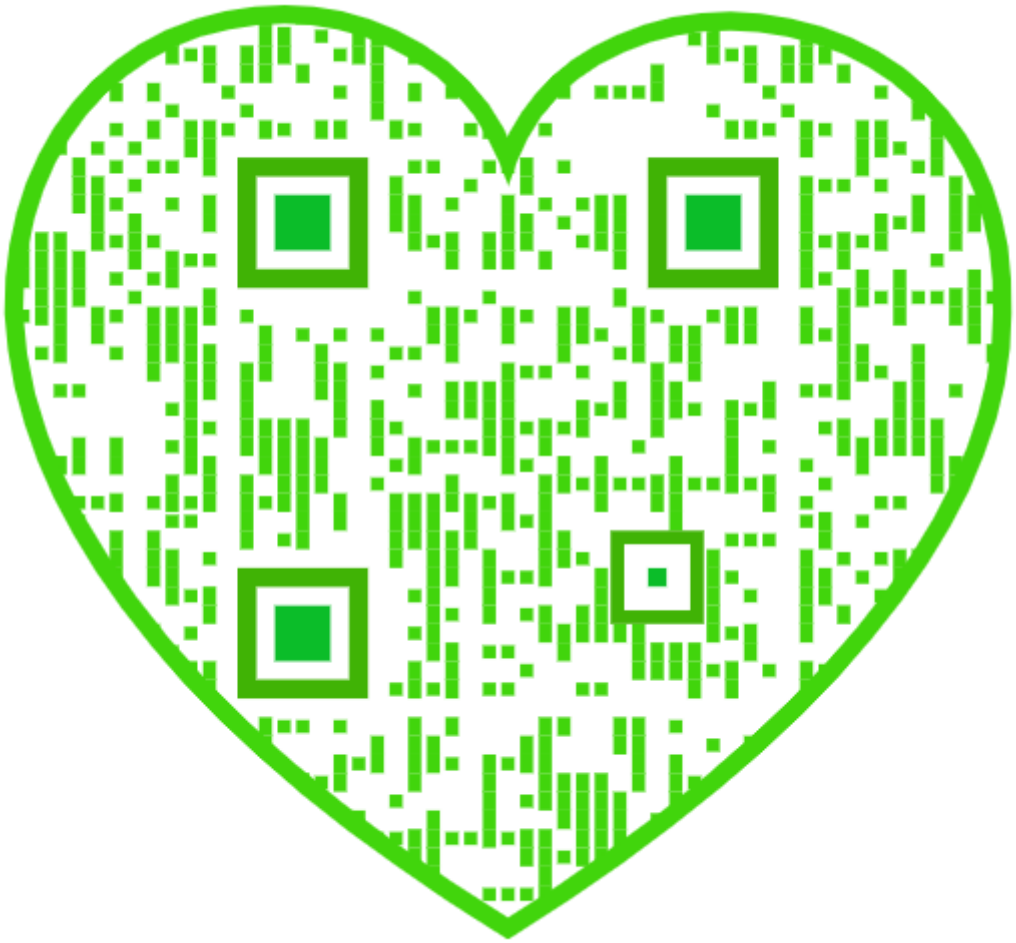


rier at the other end of the loom, and the belt, continuing to move in the same direction, conveys the carrier across the race in a similar manner as above described. The two shuttles and their carriers, therefore, follow each other from the same end of the machine. Now if, after the first carrier has been conveyed across, the motion of the belt be reversed, it is evident that the carrier would be transported back to its starting point, unless, before the return movement begins, the frames, D D, are vibrated so as to bring another channel, holding another carrier and shuttle, in line with the race-way; in which case, such other shuttle would be engaged by the lug and carried back. No further explanation is necessary to make it clear that, by suitable movement of the frames, D D, so as to bring any one of their four channels in alignment with the race, either of the three shuttles may be connected with the belt and transported through the warp. It is also evident that the shifting of said frames may be so arranged as to change one carrier for another or leave the same shuttle in action, according to the requirement of the design to be produced. Consequently the further elucidation of the mechanism reduces itself to two questions: first, by what appliances are the frames, D D, so governed as to cause their vibration at the proper moment; and, second, how is the shuttle belt actuated in order that motion may be imparted to it, direct or reverse, in accordance with the other workings of the loom. These we shall consider in their order.

The frames, D D, are moved by rods, K, which communicate with cranks on the shaft, L. This shaft is turned by gear wheels, at the further or left hand end of the machine, as shown in the engraving—in which said wheels are not represented, being concealed by other portions—connected with the revolving shaft, B, Fig. 2. It will be remembered that the motion of this shaft has been explained to be one of alternate rapidity and slowness, so that each frame, D D, will be moved to shift the shuttles while the batten is laying the weft and then will remain at rest. The gear wheels, transmitting motion from shaft B to shaft L, are arranged as one to two in the relative diameters, in order to let shaft, L, turn once while shaft B revolves twice. This by a suitable arrangement of cranks has the effect of throwing the frames, D D, forward, allowing them to remain at rest during one throw of the batten, and then of swinging them backward and again leaving them motionless during the subsequent throw, so that the two boxes or channels are alternately in line with the batten at each journey of the shuttle.

From Fig. 3, the arrangements for actuating the belt will be readily comprehended. H, as before stated, is the belt wheel or drum, and is mounted, as shown, on a shaft which ends in the bevel pinion, M. The latter receives motion from the two bevel wheels on the rotating tube, N, which loosely incloses the shaft, B. At O the shaft of the drum wheel is hung on a swivel bearing, and at P in a sliding bearing, so that the pinion, M, may be carried into contact with one or other of the bevel wheels, thereby turning the drum, H, alternately in one direction or the other.

We may here add that the mechanism for shifting the motion may be materially varied, the bevel wheels being movable, and the bevel pinion remaining stationary.

On the sliding bearing, P, is a projection, Q, which enters, as shown, in a groove on the sleeve, R, which loosely embraces the shaft, S. On the shaft, L, is a cam disk, T, which, as the shaft revolves, alternately presses against the wings, U (only one of which is shown), on the sleeve, R. The latter is thereby moved, and with it the slide, P, so as to shift the pinion, M, alternately into gear with one or the other of the bevel wheels. The loose tube, N, is terminated by a crank, which works in the same slot in the gear wheel with the crank, C, of shaft, B, but in the opposite half of said slot. This mechanical device will at once be recognized as a novel and striking method of obtaining motion, which has never heretofore been accomplished. The tube, N, must, like the shaft, B, move alternately fast and slow, but its motion is so far different from that of the shaft, B, that when the batten is at rest the shuttle belt will be moved, and *vice versâ*.

It is perhaps almost superfluous to recapitulate the various obvious advantages of this machine; which, though appearing of large proportions and heavily built, is readily worked by an ordinary three inch belt. Ordinary carpet, as is well known, is made in narrow breadths. It must be cut and fitted to the room, a process in itself necessitating considerable waste and also much labor in joining it together into a single piece, in addition to the loss of odd portions cut out here and there, to match the figures and to fit the covering into corners or around projections. Add to this the cost of labor for putting down, the rapidity with which the carpet deteriorates, on the hard lines of sewing, and the chances of a handsome pattern being ruined by injudicious matching, and compare the total expense with the cost of a carpet made by this method in a single piece. The loom inspected by us, one of the first constructed, weaves its work four yards and a half wide, and we are informed and believe that a machine can be built to weave even greater breadths. Opportunity for the elaborate designing of more beautiful patterns than have yet been produced is opened; the covering may be woven, if necessary, for the rooms of a house while the latter exists only on the architect's plans, and yet a carpet can be made and sold as cheaply as that now in use, and afford a fair profit to the manufacturer.

To Mr. James Short, superintendent of the New Brunswick Carpet Company, at New Brunswick, N. J., is due the credit of this invention, which was patented through the Scientific American Patent Agency, July 16, 1872. From this gentleman, at the above address, any further particulars or information may be obtained. Mr. Short has also obtained patents in several foreign countries. He contemplates visiting England in a few weeks, to practically introduce his loom to the great carpet manufacturers of Manchester and other cities.

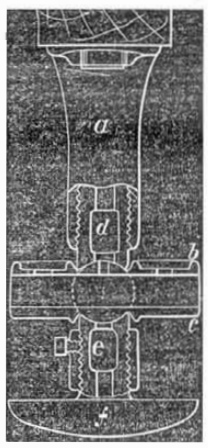
[From Journal of the Franklin Institute.]

TRANSMISSION OF MOTION.

A Lecture delivered by Coleman Sellers, at the Stevens Institute of Technology, Hoboken, N. J., February 19th, 1872.]

NUMBER II.

Next to the proper means of uniting the shafts, come the devices to sustain the shafts and permit them to revolve freely on their axes. When shafting is to be suspended under the ceiling of a room, it is provided with what are called hangers. When it passes over the top of beams or near to the floor, it is carried on what are called pillow blocks. When near to posts, the hangers are changed in form and are called post hangers. All the devices have certain parts in common. They have, in the first place, a journal box or bearing, to receive the shaft; then some form of frame to carry the box. A good many years ago—I think, perhaps, thirty years at least—a Mr. Edward Bancroft, then engaged in the machine business in Providence, R. I., invented what was called the swivel hanger. He saw that it was of the utmost importance that the bearing provided should receive the weight of the shaft over its entire length. He also saw that a long bearing would last longer than a short one, if the pressure was uniform over the whole surface. So he made the box in such a manner that it should be carried by a kind of universal joint; he hung it on pivots, and made the axis of vibration coincide with the center of the box. This swivel hanger was afterwards superseded by what is called the ball and socket hanger, now in almost universal use in this country, and which I will presently explain to you. Before the introduction of the swivel hanger, rigid bearings were the only kind used—I mean bearings which could not adjust themselves to the positions of the shafts—and such rigid bearings are still used in Europe. I have found an example of a rigid bearing in Professor Thurston's room, among models received from Europe as examples of devices in common use. I may have occasion to refer to this later. When Mr. Bancroft had demonstrated the great advantages of the swivel or self adjusting hanger bearing, he showed it to most of the prominent machine builders in the New England States, and tried to introduce it generally; but not one could be found who was willing to undertake its manufacture. They characterized it as a needless piece of refinement and far too costly to be generally used. Mr. Bancroft afterwards, in connection with Mr. William Sellers, under the firm name of Bancroft and Sellers, manufactured this hanger, and introduced it extensively. In its modified form, but the same in principle, it is now come into universal use. Time will not permit me to show you the various forms through which this hanger passed. What is known as the ball and socket hanger is what it has grown into. Various circumstances have, from time to time, caused modifications in the form of the supporting frame, but the principle has remained unchanged. Fig. 8 shows a section of the modern hanger. The part marked a is the frame or hanger, b, the top box, and c, the bottom box, the two halves united forming what is called the "box," that is, the journal box or bearing—the bearing in which the shaft rotates. This box is provided, top and bottom, with spherical surfaces, so placed as to be in reality, portions of a sphere which has its center in the center of the axis of the box; d and e are what are called the plungers. These are screwed into the frame, and are provided with cup shaped ends to clasp the spherical parts of the box. The box can rock to a limited extent in every direction in these cup shaped ends. The plungers serve a double purpose; 1st, of providing the socket for the sphere to roll in; 2d, to permit of a vertical adjustment of the entire box to bring them in line one with another. At f is an oil dish to catch the drippings from the box. It is quite evident that a shaft placed in such a bearing will control the positions of the box, and will press uniformly over the entire length of the box. This is a very important feature, and I solicit your earnest attention to its advantages as compared to a rigid bearing. Imagine, if you please, a hanger in all respects like the one I have shown you, but with its box made in one piece with its frame. These hangers are to be attached to beams, some distance from each other, and they must be bolted securely to the beams in such positions as will insure all the boxes in the entire series being in line one with another, so that a shaft placed in the boxes will rotate freely without binding. You can readily see that to do this the foot of the hanger must be carefully fitted to the beam, so that a line stretched through the various boxes will touch all parts of each. This involves greater skill and much time in putting up. This skill and time is at the cost of the purchaser and user of the hanger. Then when they are in place, the warping or twisting or sinking down of any one beam will throw the bearing out of line, and thus tend to cramp the shaft on its bearings. With the ball and socket hanger, care is only required to bring the hangers in line side ways; the plungers admit of adjustment vertically, and the shafts twist the box into line with itself. Thus all skilled labor is dispensed with in putting up, and possible adjustment is at all times practicable.



But the most important feature of this hanger is the possibility of using longer bearings or boxes than with the rigid hanger. With the latter, the longer the box the more difficult to line, and the more useless friction if out of line. With the swiveling principle, the box adjusts itself, and thus takes a uniform bearing over its entire length. This is of the greatest importance, and influences the material forming the box. With a pressure not exceeding fifty pounds per square inch, and oil well distributed over the surface of box, the metal of the shaft will not touch the surface of the box; it will run on the oil used as a lubricator. The oil under this pressure is not squeezed out, and maintains its lubricating properties for a long time. Hence, if the shaft does not touch the box, it matters little what metal is used in making the box. Cast iron is the cheapest and most readily worked into shape. It is, in reality, the most durable of the metals for the purpose if kept well oiled, but the poorest if allowed to run dry. Brass or bronze has been used to a great extent, and lately a metal called Babbitt's metal has met with favor as a lining metal for boxes, but I may mention that a cast iron nut on a lead screw of a lathe will outwear a brass nut two to one, and cast iron gear wheels are much more durable than brass under limited pressure. I mean if the pressure on two pairs of wheels, one pair iron and one pair brass, be the same, and the pressure on both be within the limit at which cast iron will run without breaking, the cast iron wheels will last much the longest. Brass is resorted to for great toughness, not for durability. The soft metals, under the general term of Babbitt's metal, are cast into recesses in journal bearings, and are extensively used. There are places where its use is advantageous, but for shafting purposes its use is to be discouraged. All soft metals, while they do not cut when permitted to run dry, in the way cast iron is sure to do, yet serve to catch the grit and dirt in the atmosphere which finds its way in with the oil, and the soft metal holds these little sharp particles, and thus gradually grinds down the shaft running in it. When it is desired to grind down a cylinder of hard metal, lead clamps are applied to its surface very like journal boxes, and into these clamps oil and emery are fed. The lead will hold the emery, and thus reduce the size of the hard metal without serious wear on its own part. Many of you may have heard that the use of soft metal is cheap. You will have been told that boxes cast with a recess to hold the soft metal can be used as they come from the foundery, and thus all labor of boring and fitting be dispensed with; the shaft can be laid in place on the cast iron shell, and soft metal, melted in a ladle, can be poured in, thus filling the recess and insuring a fit. This sounds very plausible. Let us analyze it, as is proper in all such cases. The box with its recess must be rather larger, to be of equal strength, with one cast without such recess, Babbitt's metal costs much more than cast iron; we may safely say it costs ten times as much. The melting and pouring and fussing over the job take time, which costs money. Now in point of fact, a pair of cast iron boxes can be planed on their faces, then bored to fit the shaft, and grooved for oil passages, for less than half of what the least quantity of soft metal would cost that can be used in such a box.

Tin and Lead Alloys.

The following alloys are prepared according to Professor Abel's formulæ, their constituents and melting points being as follows:

Constituents. Tin. Parts.	Lead. Parts.	Melting point. Deg. Fahr.
2	1	340
9	4	344
10	4	348
11	4	352
12	4	356
13	4	360
17	4	370
22	4	380
4	5	390
4	6	412
4	7	420
4	9	460
4	12	482
4	15	494
4	17	502
4	20	512
4	25	520
4	30	530
4	38	540
4	48	550
4	70	558
	Melting point of lead	620

A PLAGUE of butteflies is a rare occurrence. A short time ago, however, the town of Florence was invaded by a prodigious quantity of these insects. All the distance of the Lung' Arno between the Piazza Manin and the Barriera, and in all the adjacent streets, the passage was almost obstructed by an extraordinary quantity of butterflies that had swarmed in such thick clouds under the gaslights that the streets were comparatively dark. Fires were immediately lighted by order of the municipality and by private citizens, in which the butterflies burnt their wings, so that half an hour afterwards one walked upon a layer formed by the bodies of the butterflies an inch thick ! ! ! They were of a whitish color, and some of the streets appeared as if covered with snow; at least, so say the Italian papers.

THE only persons left at the Tip-Top House on Mount Washington are three signal officers, who are equipped with a large stock of coal, four barrels of onions, about forty hams, twenty bushels of potatoes, a good supply of canned goods, and all manner of groceries in profusion, a violin, harmonicon, a good-sized library and quantities of newspapers, and other tip-top material to enable them to spend a pleasant winter.

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THE USE OF WATER GLASS IN BUILDING.

The application of water glass in the building trade depends chiefly upon its forming a chemical combination with the carbonate of lime and quicklime of the wall dressing by converting both into silicate of lime, which is then in a condition to resist the influences of air and damp in a far higher degree than was the case before. But it also imparts an extraordinary solidity to all articles of burnt clay, as floor tiles, bricks, roofing tiles, etc., as well as to the most porous crumbling sandstones, which imbibe the water glass with great avidity. Instances are known in which very soft tiles, after being saturated with water glass, when laid upon the fireplace of an evaporating stove, in which frequently acid vapors are evolved, have remained quite unaltered after twelve years. Hence, in the construction of new buildings which are not to be dressed, whether of bricks or stones, it is advisable always to use a coating of water glass.

On this subject H. Wagner, of Pfiffligheim, remarks, in the *Hesse Trade Circular*, that four kinds of water glass are used —potash water glass, soda water glass, the double water glass (a combination of equal parts of potash and soda with silica), and fixing water glass. For the technical application of double water glass, it is sufficient to mix 3 parts of concentrated potash water glass with 2 parts of concentrated soda water glass. The fixing water glass is a potash water glass completely saturated with silica, to which a portion of soluble soda silicate is added, that is, to 3 parts of concentrated potash water glass, 1 part of soluble soda silicate. The latter is prepared by fusing together 3 parts of pure anhydrous carbonate of soda with 2 parts of powdered quartz, and making a concentrated solution of it. The fixing water glass has the great advantage of producing no efflorescence of carbonate of soda, and the coating is clean and free from spots, on which account it is preferred for ornament and internal decoration. In coating with water glass, it is important to consider the degree of dilution, and the proportions given here should be modified according to circumstances. Whatever be the kind of water glass, that of 33°, diluted with twice its weight of rain or river water, should be used for the first coat, but with equal weight of water for the second and third coat. Water glass of 66° is diluted for the first coat with 5, for the second and third with 2½, parts by weight. These proportions are retained for sandstones and bricks. Upon a surface of 100 square meters, the following proportions are required:

For first coat,	4 lbs.	of water glass of	33°,	and 12 lbs.	water.
" second "	4 lbs.	"	33°, "	8 lbs.	"
" third "	3 lbs.	"	33°, "	6 lbs.	"

To produce a fine and durable coat of water glass upon a wall, special regard must be had to the dressing. The problem is to give it a stonelike solidity, and to fuse it evenly with the wall, taking care, at the same time, that the water glass shall soak uniformly into every part. In order to obtain this, the mortar should be more thin than fat; the water glass would penetrate with difficulty into limy mortar, and cause also cracks, which should be avoided.

This must be well dried and exposed for a longer time to the air, to be converted into a subcarbonate of lime, because otherwise the quicklime would partially decompose the water-glass. The wall thus prepared is saturated with soda or double water glass of 33°, using the same process of dilution for each coat as above given. With larger surfaces small rain spouts are used, from which the jet is distributed like fine rain by being forced through a strainer provided for the purpose. This operation may be repeated two or three times taking care, however, that the pores of the wall are not closed by a too frequent charge, or too concentrated solutions, and thus become unfit to receive the colors.

In order to secure a good uniform ground, a water glass mortar should be prepared in the following manner: 10 parts of sharp dried sand, and 3 parts of quick lime, slaked in the air (by sprinkling fresh burnt lime with water, and frequent stirring till it is reduced to a fine powder), are mixed with 2 parts of chalk, or limestone, powdered quite dry and passed through a moderately fine sieve; then this mixture is worked into a plastic dough with a solution of soda water glass of 33°, diluted with 2 parts of water, so that it can be applied like ordinary mortar for dressing. This mortar does good service also in the joints of brick walls, and wherever it is important to guard against air and damp. It will differ from this according as more sand or chalk is added, and in many cases also the water glass solution employed is more concentrated. After drying, which takes a few days, it becomes stone hard, and should be saturated repeatedly in the manner described with a solution of soda water glass (which is cheaper than potash water glass, and for this purpose quite sufficient).

When the foundation is laid in one way or the other, after drying, the coating with color may be proceeded with. The colors to be applied, before they are brought in contact with the water glass, are moistened with sufficient rain, or river water, without rendering them liquid. The more plastic and uniform this color paste is, the better it mixes afterwards with the water glass, and the less fear there is that the color will curdle.

Even when the different coats are laid on as prescribed, the double water glass should be used. After twenty-four hours a fresh coat may be applied, and to prevent an efflorescence of carbonate of soda, it is advisable to give the last coat with fixing water glass. In order to impart a certain gloss like oil paint, the last coat, when dry, is gone over with a very dilute solution of fixing water glass, taking care that those parts which imbibe slowly present a uniform appearance. The choice of the various colors is by no means indifferent, as many have so close an affinity to water glass that they are no sooner in contact than they curdle at once to a useless mass, as often happens with the commercial oxide of iron, when, after its preparation, it still contains free sulphuric acid. Other colors are materially changed in their tints; for this reason, none of those colors derived from the organic kingdom should be used, as they fade sooner or later.

HAS OUR CLIMATE CHANGED?

There has been much apprehension, in the city of New York and throughout its suburbs, lest the supply of Croton water should fail to meet the requirements of the rapidly growing population. At times during the past year, it was even believed that the supposed deficiency would be so great as to render delay in providing other resources dangerous to the public health. It was freely asserted that the scarcity was due to the amount of rainfall, which theorists claimed had materially diminished in the United States in proportion as the surface of the country had been cleared of forests and built up or placed under cultivation, With a view to determining the question with accuracy and to setting all doubts on the subject at rest, Mr. Daniel Draper, Director of the Meteorological Observatory in Central Park in this city, has caused to be made, during every day of the past three years, reliable observations from self-registering rain gages. The results obtained, as well as other valuable information regarding the climate of this section of the country, he has embodied in the annual report, of the department under his charge, for the year 1870.

During 1869, the total rainfall was 46·82 inches: 1870, 43·32 inches, and 1871, 52·06 inches: so that it is evident that, instead of there being a decrease as has been so strongly urged, the last year shows a considerable increase of either of the years preceding. To render the fact still more striking, the results of observations made during the past thirty-six years are added, from which it is proved that from 1835 to 1846 the rainfall was 39·5 inches, from 1845 to 1856, 47 inches, from 1855 to 1866 and from 1865 to 1872, 52 inches, showing a large and steady augmentation.. During the above period, although great changes on the face of the country between the Mississippi and the Atlantic Ocean have been made, no corresponding diminution can be traced in the mean amount of water that has fallen, so that it is considered as concluded that over large tracts there is perfect compensation, the decrease at one place being compensated by the increase at another.

But the actual supply of water does not depend upon the rainfall alone. It is diminished by evaporation caused by heat and consequent dry winds, by the condition of the surface which, if hard or frozen, prevents percolation, and also, in combination with the latter, by the rapidity of the descent of the rain, in which event the quantity of water that belongs to a whole month may fall in the course of a few hours, and, rushing over the surface, may be lost. Agricultural conditions also, though not affecting rainfall, have a powerful influence in causing rain-waste. Thus a growing plant vaporizes from its leaves an immense amount of water which its roots have abstracted from the soil. A sunflower, it is stated, will remove twenty ounces of water in a single day.

From the consideration of the amount of rainfall, it is a natural transition to that of the problem: Is the climate of New York and the Atlantic States undergoing modification? In this connection, we may cite certain interesting facts which are doubtless generally familiar to the inhabitants of this city. Thus there are no longer the deep snows which characterized the winters of years gone by; the cold weather seems to begin later, and probably all have remarked the absence of the huge sleighs which were substituted for horse cars and stages in our streets. Indeed, so far as appearances go, the winters have become milder, and, on the other hand, the summers have become cooler; for, in spite of the vagaries of the thermometer during last summer, when at times the mercury seemed to have taken a permanent abode among the nineties, it will be remembered that the intense heat rarely exceeded a few weeks in duration and did not extend through months of unbearable sultriness. In a rapidly growing city like New York, several local causes may be assigned in explanation of these changes of temperature. The quantity of fuel consumed has necessarily increased in proportion to the number of buildings erected, and, moreover the reflection and radiation of the sun's warmth from the vertical sides, or its absorption by the dark colored metal roofs of the houses, must tend to elevate the temperature and aid in producing a thaw in winter. The facts, therefore, as observed in cities, are by no means complete guides to general climatic changes.

Resort has, however, been had to data of a more extended topographical nature, for instance, the opening and closing of the Hudson River, which, flowing for 150 miles through varied localities, affords information regarding the quantity of heat over a long line. Records, nevertheless, of the past fifty years show that there has been no important change in the number of days the river has been frozen. The same is true of the Baltic rivers of Europe for the past three centuries. Again, the average height of the thermometer for the months of January, February and March for the past half century is 33 06°, which, taken in connection with the fact above given concerning the river, plainly shows that our winter climate has not changed.

The thermometer records of Philadelphia extend back to 1767; taking, as before, the first three months of the year, the average for fifty-six years is 35·56°, for different periods distributed along 89 years, 35·23°, so that the mean temperature of Philadelphia during the winter is some 2·66 degrees above that of New York. Similar records of Boston, over 86 years, show 29·66 degrees as the average, or about 3·27 degrees lower than New York. Moreover, no sensible change in this locality is apparent. At Charleston, S. C., for five periods between 1750 and 1854, the total average is 53 93°, and although the individual averages of the separate intervals differ sometimes widely the general climate has undergone no modification. Considerations such as these may satisfy us that the surface alterations, which the Atlantic States have undergone since their first settlement, as was predicted by Humboldt, have produced no meteorological effects, and that the rainfalls and winters probably remain the same as they were many years ago. While such is our final conclusion, we must bear in mind that these mean or average results exhibit only one phase of the problem. They do not show the fact that there are brief cycles of heat and cold, of moisture and dryness, under the operation of some unknown law, a law which is perhaps not of meteorological but of astronomical origin; and, moreover, they make no allowance for the imperfections in the instruments or tables used in days gone by.

Mr. Draper concludes his report with a valuable series of meteorological tables for the year 1870, from which we obtain the following data of interest: The mean hight of the barometer for the year was 29·935 inches; its difference of range 1 346 inches, mean of thermometer, 51·12°, maximum, 92°, minimum, 2°. The total depth of rain and snow water which fell for 138 days was 52 06 inches. The prevailing wind was northwest, and the total distance travelled by all winds, 6,3571 miles.

A Gigantic Pie Bakery.

Pie baking may be called a new industry and, at the same time, one essentially American. For the benefit of our foreign readers, we explain that in the United States a "pie" is the synonymous term for the English "tart" or French "tourte," meaning a compound, generally suggestive of dire misery to dyspeptics, composed of fruit and two crusts of paste. The thick deep pasty of the venison or beef of England and *foie gras* of France have their counterparts among us as pot pies, of which the principal contents are chicken. Their *habitat*, if we may be allowed to use a scientific term in the connection, is New England, where, with the traditional pork and beans, they form a staple exercise for the ostrich-like digestive organs of our Yankee brethren.

Four great firms have united their forces in this city and have formed the New York Pie Baking Company. Fifty thousand pies are daily manufactured, and we are informed that, in event of a strong demand, as many as 65,000 can be supplied. The capital stock of the company is $300,000. The buildings are constructed of brick, and are admirably arranged for the purpose intended. They are three stories high, with basement, forming the letter L, occupying four full lots twenty-five by one hundred feet, making a total of one hundred and fifty feet either way. The office is located on the second floor of No. 82 Sullivan street. The first or ground floor is used as a retail department. In the rear are located the bakery, storerooms, ice house, wagon sheds, etc. In the basement are affixed the ovens, ten in number, measuring ten by twelve feet, where also is in operation a new rotary device, which alone will bake nine hundred pies per hour. The first floor above is apportioned to the engine, boiler and delivery rooms. The second floor is the pastry department, where the mixing of the dough is done, and the third floor is given to the preparation of fruit, etc. On this floor is stationed a huge range, capable of cooking ten barrels of fruit at once, also two huge copper steam kettles with a capacity of two barrels each. An Otis elevator is brought into service here, to hoist and lower the pies and material of which they are composed.

The weekly consumption of material is 140 barrels of flour, 42,000 pounds of sugar, 5,000 pounds of lard, 500 barrels apples, 60,000 pounds pumpkins and squashes, 60,000 eggs, 500 bushels berries in their season, 800 pounds beef for mince, 1,500 pounds cocoanut, 100 boxes lemons, and spices accordingly. They also have in constant use about 150,000 pie plates, and give employment to 100 workmen, running 35 wagons.

Dr. HECTOR'S report on the coal deposits, as laid before the New Zealand Parliament which met on the 16th of July, is eminently satisfactory, and the value of some fields may be gathered from the following extracts. The Gray River district: The coal seam is 16 feet thick, and has been proved by underground working to be of uniform quality without admixture of slack, throughout an area of 30 acres. The quantity of coal obtainable without sinking is at least 4,000,000 tuns. The area of undisturbed coal above the water is more than half a square mile. A much larger quantity of coal can of course be obtained by sinking. Malvern Hills, Canterbury: The quantity of coal that can be obtained here, level free, is about 3,000,000 tuns. Dr. Hector, however, adds that neither mines can be worked to advantage (especially the former) till a railway is constructed from the mines to the sea, and considers the amount of coal discovered sufficient to warrant the expenditure required for this purpose.

PROFESSOR WATERHOUSE, in a recent paper on the resources of Missouri, gives the following description of the iron mountains, for which the State is famous: "Shepherd Mountain is 600 feet high. The ore contains a large percentage of iron. The hight of Pilot Knob above the Mississippi river is 1,114 feet. Its base, 581 feet from the summit, is 300 acres. The upper section of 141 feet is judged to contain 14,000,000 tuns of ore. The elevation of Iron Mountain is 228 feet, and the area of its base 500 acres. The solid contents of the cone are 230,000,000 tuns. It is thought that every foot beneath the surface will yield 3,000,000 tuns. At the depth of 150 feet, the artesian auger was still penetrating solid ore. These mountains contain enough ore above the surface to afford, for 200 years, an annual supply of 1,000,000 tuns. The iron is strong, tough and fibrous."

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The Railroad Conductors' Association.

A convention of the members of the Railroad Conductors' Life Insurance Company was recently held in Louisville, Ky. The association, founded four years ago, has granted 5,260 certificates of membership. Of these, 1.020 holders have for various causes forfeited their places in the society, 519 have been permitted to withdraw, 46 have been killed at their posts, 71 have died of disease, and 17 have been disabled for life. The plan of the association is the levying of an assessment of one dollar on each member whenever a brother is killed, dies by disease, or is incapacitated from working. During the past four years, the Company has paid to families of deceased members the sum of $395,989, being a yearly tax on each survivor of $33.50.

During the year closing August 1, 1872, sixteen conductors met with death at their posts, of whom eleven were on freight trains and five with passenger trains. Two conductors had each an arm amputated and one lost a leg by accident; one died of sunstroke on the New Jersey Southern, three died of spine disease, and the astonishing number of twelve died of consumption, every one of whom were passenger conductors. It is a matter of grave consideration for conductors generally that this disease claims such a large percentage of their number, but it is presumable that the eating of hurried meals, keeping irregular hours and exposure to all weathers is the cause of it. One more reason may be added: the confined and vitiated atmosphere of the railway cars, in which conductors spend so much of the irtime. This of itself is enough to bringon fevers and consumption.

A New Theory of Volcanoes.

Mr. Mallet has propounded a new theory respecting volcan ic energy, which, in principle, is exceedingly simple:

It is recognized by physicists that our earth is gradually parting with its heat. As it cools, it contracts. Now if this process of contraction took place uniformly, no subterranean action would result. But if the interior contracts more quickly than the crust, the latter must in some way or other force its way down to the retreating nucleus. Mr. Mallet, says the London *Spectator*, shows that the hotter internal portion must contract faster than the relatively cool crust; and then he shows that the shrinking of the crust is competent to occasion all the known phenomena of volcanic action. In the distant ages when the earth was still fashioning, the shrinkage produced the irregularities of level which we recognize in the elevation of the land and the depression of the ocean bed. Then came the period when, as the crust shrank it formed into corrugations; in other words, the foldings and elevations of the somewhat thickened crust gave rise to the mountain ranges of the earth. Lastly, as the globe gradually lost its extremely high temperature, the continuance of the same process of shrinkage led no longer to the formation of ridges and table lands, but to local crushing down and dislocation. This process is still going on, and Mr. Mallet not only recognizes here the origin of earthquakes, and of the changes of level now in progress, but the true cause of volcanic heat. The modern theory of heat, as a form of motion, here comes into play. As the solid crust closes in upon the shrinking nucleus, the work expended in crushing down and dislocating the parts of the crust is transformed into heat, by which, at the places where the process goes on with greatest energy, "the material of the rock so crushed and of that adjacent to it are heated even to fusion. The access of water to such points determines volcanic eruption."

Mr. Mallet has confirmed his speculations by observation and experiment; and he is able to show by indisputable calculation that less than one fourth of the heat at present annually lost by the earth is sufficient to account for the total annual volcanic action, according to the best data at present in our possession.

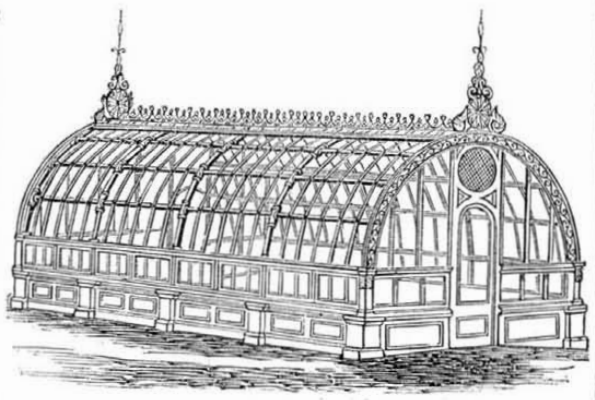
In brief, Mr. Mallet's theory tends to show that the volcanic energy of the earth is a declining force. Its chief action had already been exerted when mountains began to be formed what remains now is but the minutest fraction of the volcan ic energy of the mountain forming era; and each year, as the earth parts with more and more of her internal heat, the sources of her subterranean energy are more and more exhausted.

THE London *Times* states that the attention of Professor Pepper, during his visit to the United States, will be directed to the "great recent development of mechanical and inventive ingenuity among their citizens, a development which has its gage in the extraordinary number of American patents which have been taken out during the last few years. A succinct history of the inventions of a given period would doubtless throw much light upon the other aspects of its civilization; and something like this is contemplated by Professor Pepper, as the ultimate result of his travels."

IMPROVED CONSERVATORY.

At the recent Exhibition, at Birmingham, England, of the Royal Horticultural Society, the gold medal was awarded to the elegant structure put up and exhibited by Messrs. Howitt & Co., of Westminster, London, of which we now give an illustration, for which we are indebted to the *Mechanics' Magazine*.

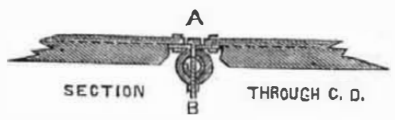
The conservatory in question was 30 feet long by 17 feet wide by 12 feet high, and the peculiarity of mode of construction consists in the roof principals being untrussed, and

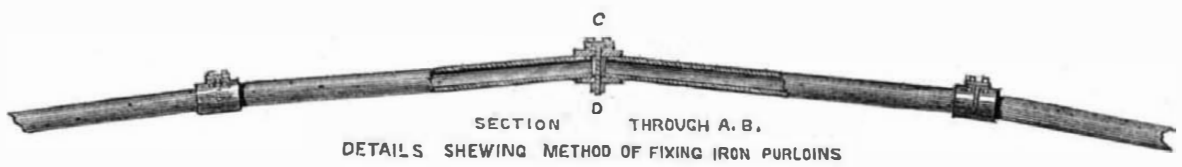


IMPROVED CONSERVATORY.

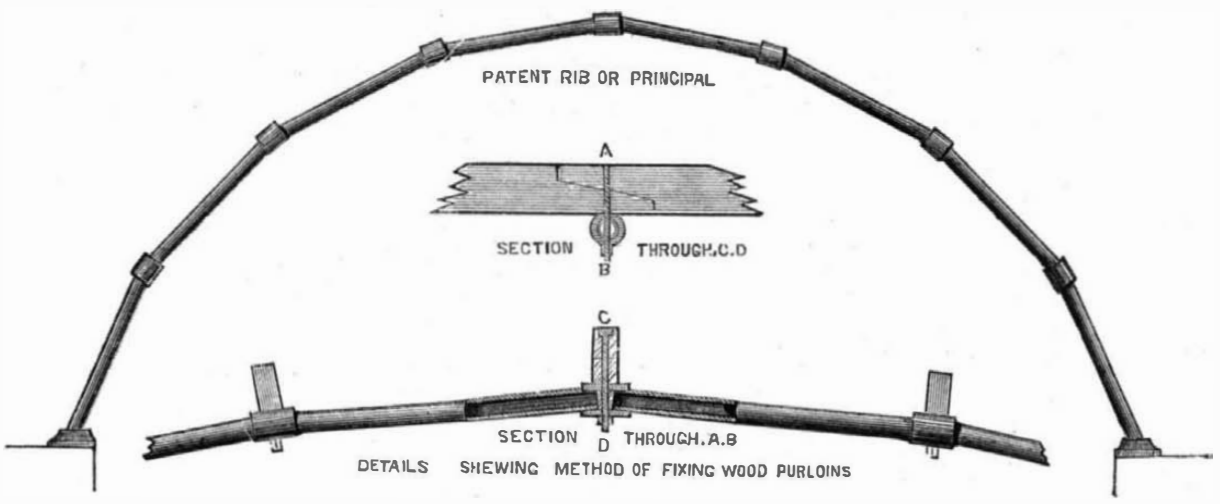
in dispensing with the tie rods, so that a clear headway is obtained, although the roof springs within two feet of the ground. Though apparently in the form of a circular segment, the roof is polygonal, whereby the strains upon the straight tubular sections forming the sides of the polygon, being entirely in the direction of their length, are disposed in the direction of maximum of resisting power, and the sections are relieved from all transverse strain, so that their dimensions and materials may be minimized. The strains, concentrated at the joints, are there sustained and counteracted by the strength of the sockets, suitably proportioned,

DETAILS.





DETAILS SHEWING METHOD OF FIXING IRON PURLOINS



DETAILS SHEWING METHOD OF FIXING WOOD PURLOINS

which are bored to receive the tubular sections, at angles calculated to give the requisite curvature for the span of roof.

This rib or principal especially combines the extremes of strength and lightness, as far as practicable. The tubular sections of roof being socketed and not screwed together, and all the other parts fastened together by screws and bolts, houses constructed upon this principle may readily be taken to pieces and re-erected by unskilled labor. Although curved roofs have always been considered by the first authorities as the form best adapted for the propagation and healthy growth of plants, still the first heavy outlay for bent glass, added to the great expense, trouble, and annoyance of replacing it when broken, have, until Messrs. Howitt & Co. produced their polygonal roof, prevented the general adoption of curvilinear roofs. By Messrs. Howitt & Co.'s system, all the glazing is with straight panes, from purlein to purlein, which are bolted upon each socket of the ribs; and by a special arrangement the condensed moisture in the house passes from the inner surface of the upper panes on to the exterior surface of the next adjoining inferior, and so on to the bottom, so that all drip from condensation is avoided.

When the span of the roof exceeds a certain limit, an arrangement of braces is provided—in lieu of an undue and unwieldy strengthening of the sockets—so as to tie the alternate joints or sockets together, and thus give greater strength and rigidity to the rib or principal; but the depth of the truss thus formed is very moderate, and such as not to interfere with the headway.

THE city of Glasgow, Scotland, is supplied with water drawn from a highland lake, 34 miles distant. The cost of the works was $4,500,000.

Boracic Acid as a Preservative for Milk and Beer.

Boracic acid has lately come largely into use in Sweden for the preservation of milk, and a mixture of equal parts of this acid and alum has been applied for the preservation of meat, as well as for improving its appearance when discolored by packing in oaken barrels. The former is being sold under the name of aseptin, the latter as double aseptin. Hirschberg has lately made experiments in order to ascertain the precise value of the acid for the purposes described. In June, 1871, he dissolved fifteen grains and a half pulverized boracic acid in two pounds fresh milk, and kept it at a temperature of 54° F.; and for purposes of comparison, he left some pure milk in the same room. This was tested at intervals of six hours; after 96 hours, a very slight acid reaction was noticed; this did not become plainly visible till 120 hours had passed. The milk containing no boracic acid indicated a slight acid reaction after only 36 hours, and a strong acidity after 48 hours. The cream separated completely from the latter in 48 hours, while, on the former, only very little was found even after 120 hours. From these experiments it seems that boracic acid may be considered a very effective preservative of milk. A similar experiment was made with beer. On October 7, 1871, fifteen and one half grains of this substance were dissolved in a bottle of lager beer, brewed on August 30, and the same quantity was dissolved in beer brewed on October 2; both bottles were left loosely corked in a temperature of 56° F. Both kinds indicated a slight acidity, owing to carbonic acid, which was present before the boracic acid had been dissolved in them. This reaction remained, after the addition, without increase for a week. From October 14 to November 14, the beer was left at a temperature varying from 35° to 63·5° F., whereupon it became opalescent; but still no increase in acidity could be perceived (although, as has been stated, the bottles had been only loosely corked), but it was no longer fresh. The opalescence disappeared again after the bottles had been allowed to stand in a room with a constant temperature of 635° F., but the beer was not spoiled till the end of the month. It remains to be seen whether boracic acid is similarly useful in the hot summer weather.

The Retention and Coloring of Eggs and the Mimicry of Sound by Birds.

A correspondent of *Nature* forwards the following interesting facts observed in New Zealand: Regarding the length of time during which a bird can retain its egg, the case is mentioned of a kingfisher that began six nests, abandoning all in turn and depositing her egg in the seventh, after working for over six weeks in a condition analogous to pregnancy. The labor was incessant, three of the homes that were excavated in a turf chimney and abandoned being so far furnished that a deposit of eggs must have been imminent on three occasions during the above period.

In answer to the question: Can a bird influence the color of its eggs protectively? the writer says that a female bittern, when kept in a grassy enclosure, laid an egg of a pale bluish green color, precisely like that of a heron. The egg of the bittern naturally is of an olivaceous buff tint which harmonizes well with the half faded leaves of aquatic plants, of which the nest is often built. It is doubtless probable that the egg thus became tinged to secure for it the protection of the verdure of the grass in which it was deposited. Another and more curious instance is that of the whistler, or small cuckoo placing its egg in the nest of the blight bird. The latter is a bird foreign to New Zealand and builds a suspended nest; the eggs are clear blue green in color. The egg of the cuckoo is greenish dun, but in order to place it in the hanging nest where it will be free from reptilian invaders, the writer has found cases where it has manifestly changed the color to one closely resembling that of the eggs of its dupe, so that the latter would fail to distinguish the addition to its deposit.

Referring to the mimicry of sounds, it is stated that, in camping for some days on a river bed, the author frequently heard what he took to be one of the notes of the *hæmatopus* but that wader was nowhere to be seen; at length he traced the call to the piopio, a bird with feeble powers of flight, yet one that delights in the open glades of river beds. The mimic cry was always given when near to a stream just where the redbill (*hæmatopus*) would be likely to be found. A pair of redbills can drive away a hawk; now a hawk, "from his place on high" perceiving something near the water, might forego its swoop on hearing the mimicked note of the wary yet bold redbill. The common gray warbler, it is also stated, gives an exact imitation of the cry of the common tern, one of the boldest birds in defence of its young.

THE fact that the atmosphere at and near the sea shore is richer in ozone than it is in inland places has been explained by M. Gorup Besanez, who finds by experiment that ozone is formed by the evaporation of water. Ozone is oxygen in a most active condition.

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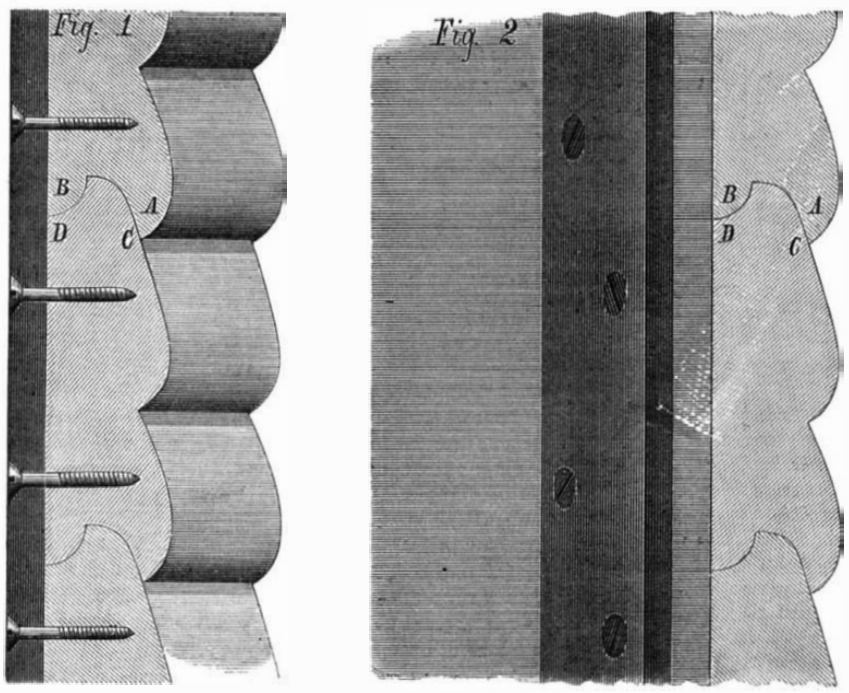
ROLLING SHUTTERS.

The invention represented in our engravings consists of a number of peculiarly formed wooden slats, so attached together as to form a rolling shutter. Fig. 1 is a sectional and also a front view of the device, which is shown in its full size. The lower edge of each slat has a curved groove, A, and a heel, B, which corresponds with the tongue, C, and groove, D, of the upper edge of the slat next below. The heel, B, forms the fulcrum upon which the lower slat turns when the shutter is wound upon the roller. When unrolled, the tongue, C, falls into the groove, A, with absolute certainty. The slats are connected together by means of leather straps screwed to the backs, as is shown in the section in Fig. 1 and in the rear view in Fig. 2, so that a flexible shutter, that cannot fail to joint even when warped, is obtained. In Fig. 3, the invention is represented as applied to a store window, a portion of the right hand shutter being broken away to exhibit the mode of construction which, from the fact of there being no concealed hinges or other mechanism except the simple appliances above described, is both inexpensive and efficient.

For further information, regarding the manufacture of the device, or for state rights, address Hardy & Voorhees, foot of North First street, Brooklyn (E. D.), N. Y. Patented through the Scientific American Patent Agency, May 7, 1872, by Alois Kohler.



Lavender Oil.

In England large tracts of land are devoted to the cultivation of the lavender plant. Only a moderate application of manure is necessary at the outset in the autumn, when the planting takes place; and after the first year's harvesting, the plants have grown to such dimensions that every other row has to be taken out, and every other plant in the row that remains. The three years' growths are the first to come to maturity, and then the second, and then the third. The harvest takes place in August. The cutting, which is done by the sickle, appears an art of itself, which affects the crop in the future year. The laborers are followed by women and girls, who immediately pack and tie the lavender up in mats, to protect it from the rays of the sun, or otherwise the quantity of oil to be extracted would be reduced before it could be taken in hand at the distillery. Small quantities have been previously cut before they are fully ripe, for Covent Garden market, or for sale about the towns and villages in the neighborhood. The distillery process is carried on upon the spot, as the volumes of smoke from several chimneys and the strong odor of herbs around the buildings sufficiently testify to some very odoriferous process within; for it must be remembered that peppermint, rosemary, dill, camomile, as well as lavender, have to find their way to the same crucial test. Beneath a brick-built shed stands a row of stills, with what are called worm tubs attached to each still. Upon the ground floor, the furnaces are being attended and the percolator watched, as a trickling noise indicates that the oil is being extracted by the process going on. Above the furnaces are the stills, of dimensions sufficient either to contain half a tun or a tun weight of herb, and the building is spacious enough to admit of carts being driven in for the purpose of unloading. The still is filled thrice in four and twenty hours, namely, eight hours to a run. The men get upon the upper floor, remove the still head by a lever, then take the lavender from the mats and tread the stalks down with their feet until the copper is tightly filled to the brim. Liquor at boiling heat is then taken from the top surface of the worm tub, although at the bottom and lower surface the water is quite cold, and the furnaces are set to work. The worm consists of piping attached to the head of the still, and passes round and round the tub which contains the cold water. The men watch the bringing over of the still, that is, the moment when the liquor begins to flow over the head into the worm. Directly it does so, they know that the oil is running, and immediately damp down the furnaces. The boiling liquor from the herbs, by passing through the tubing immersed in cold water, becomes condensed, and the oil separates from the water and runs into the percolator at the foot of the worm tub. This bringing over is the most critical point in the whole operation; then great attention and experience are needed, otherwise the herbs, both stalk and flower, might be taken into the worm, and the oil be spoiled. So well practised, however, are the men employed that what is called a "run foul" is scarcely known during the whole of the distilling season. From thence it is taken and placed in dark glass bottles with short necks, containing 4 lbs. to 7 lbs. each, ready for merchandising. When one lot has been distilled, the still top is removed by the lever, and the charge taken out with long forks. The steam and vapor that arise are very great, for the uninitiated quite overpowering; and what is termed the "walk" being very heavy, the men themselves have to labor hard to get out the refuse, which is thrown just at the back of the building for manure. The coppers are filled up again with herbs, fresh water is pumped into the worm tub to supply what has been taken off the surface for the still, and to replace what has passed off in the evaporation that has been always going on, and the process again proceeds. The quantity of oil extracted from a tun of lavender varies according to the influence of the season; from 15 lbs. to 16 lbs. is considered a fair average; very seldom it reaches 21 lbs., sometimes not more than 10 lbs. The distilling lasts about two months, from the first week in August to the second week in October, according to the abundance or otherwise of the surrounding crop. This business is separate from the growing; the small growers as well as the large take their crops to the distillery, and pay a certain agreed upon rate per tun.

THOSE who have lately become conscious of the existence of certain facts are invariably apt to suppose that those facts have only lately arisen. After a changed state of mind has made us observant of common occurrences which we were before indifferent to, there often results the belief that such occurrences have become more common. It happens so even with accidents and diseases. Having lamed himself a man is surprised to find how many lame people there are; and, becoming dyspeptic, he discovers that dyspepsia is much more frequent than he supposed when he was young. For a kindred reason, he is prone to think that servants do not behave nearly so well as they did during his boyhood—not remembering that in Shakespeare's day the service obtainable was similarly reprobated in comparison with the "constant service of the antique world." Similarly, now that he has sons to establish in life, he fancies that the difficulty of getting places is much greater than it used to be.—*Herbert Spencer.*

PLATING AND COATING METALS.

A new process for coating metals has been recently patented by M. De Lobstein, of Paris. The improvements in the method of plating are made with a view to obtain such an adhesion of the covering metal as will subsequently permit of a metallic deposition upon the underlying metal by the application of heat. In order to get an electro-chemical covering deposit of such thickness and crystaline structure as to answer to this purpose, the inventor employs very dilute alkaline and acid baths, which are used cold. The tin bath consists of 1000 parts of water, 22½ parts of caustic soda, ½ part of cyanide of potassium, and ¼ part of tin salt. The copper bath consists of 1000 parts of water, 25 parts of cyanide of potassium, and 12½ parts of carbonate of copper. The zinc bath consists of 1000 parts of the liquid supplied by the renewal of the batteries, or of 1000 parts of water and 30 parts of sulphate of zinc produced from the batteries. The lead bath consists of 1000 parts of water, 22½ parts of caustic soda, and 2½ parts of the residuum of the batteries. For the rare or precious metals—silver, gold, nickel, bismuth, and cobalt—the well known cold solutions are used. The battery for a 500 gallon bath is composed, first, of a lead trough, second, a brass sheet with three wooden cross pieces placed on it, a zinc sheet being placed on these wooden pieces. Afterwards the trough is filled with 60 liters of water. This pile works at three different stages of power of the electrical current, according to the effect to be produced. For the first stage it suffices to pour into the water of the trough 400 grammes of sulphuric acid per day. For the second stage or combination, one kilogramme acetate of lead mixed with three kilogrammes of sea salt is put under the zinc sheet, and care is taken that the liquid of the pile covers the zinc sheet. This cell gives a very regular current during eight consecutive days, without any other ingredient. For the third stage, to the action of the acetate of lead is added that of the sulphuric acid, as it is said, for the first stage. Metallic lead is the residue of the acetate, and the zinc consumed in proportion of work done is used for the zinc baths. In order to set the cell to work, only trifling quantities of acetate of lead, of sea salt, and sulphuric acid are wanted. The articles to be put in the bath are cleaned, according to the nature of their metal, either by immersing them in potash solution or solutions of sulphuric or muriatic acid. The baths are supplied with anodes of the same metal as the covering to be obtained. As soon as the articles put in the bath are sufficiently covered, they are withdrawn, washed with fresh water, and carried to a stove, where they remain submitted to the degree of heat which is required for the melting of their electro-chemical cover, which occupies from five to thirty minutes. By these means, in consequence of the melting together of the crystaline particles which form the electro-chemical cover in its whole depth, a cover like to that of a melted metal is obtained. If it is desired to cause the soldering of the cover with the metal underneath, the heat is raised; the metal under the cover, dilating and evolving metallic vapor, becomes superficially combined with the electro-chemical covering and effects the soldering. If it is desired to obtain an alloy of two metals or more, the article is covered with different electro-chemical layers; afterward it is submitted to the action of the heat, and the melting of the layers gives either various alloys or new metals adhering and soldered to the under metal. The products of this process acquire all the qualities of a melted metal, namely, malleability, ductility, cohesiveness, etc., and can be softened, polished, rolled, and worked, in the same manner as if they really had been covered with a melting metal. It has already been stated that this system makes use of heat to alter the former constitution of the electro-chemical metal, which is formed with crystaline deposits, and add to the same the very properties of melted metal, namely, tenacity, ductility, malleability. To attain the required end, namely, the formation of a very small and uniform crystaline coating, cold baths very slightly concentrated are used, with batteries having large surface, giving great power, and continuous and especially regular in working. The chemical formula of the constitution of the baths is therefore of an exceptional importance, as it would be impossible to go materially below that formula, and also to go beyond its small degree of concentration, without obtaining bad metallic deposits that would be injurious to the whole system. Another part of the invention relates to the production of ornamented metallic articles by means of electricity and heat. The object, coated with a sufficient coating of metal, is placed in the stove and submitted to a temperature more or less inferior to the melting degree of the coating metal. The coated metal, which is called "subjacent

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metal," and the coating one, which is called the "electro chemical metal," oxidize when thus connected in a different manner from that in which they would had each been separately submitted to the same degree of heat.

Correspondence.

The Unequal Expansion of Metals.

To the Editor of the Scientific American:

A description of a fire alarm was published two or three years ago, taken from *L' Union Medicale*, a French journal; it described an arrangement, contrived by M. Robert Houdin, which consisted of steel and copper blades, soldered together and fixed on a board, like a knife blade standing with its edge or back up, only touching the board at one end of the blade where it was fastened and connected with one pole of an electric battery; the other end was near a button connected with the other pole of the battery. Owing to the unequal expansion of the metals, when heat was applied the strip would bend and touch the button, and a bell connected with the battery would ring as long as contact continued.

About the time of said publication, a fire detector was for sale at 80 Cedar street, New York. I do not remember the name of the proprietor of it, but it was dependent on the same principle as Mr. Houdin's invention; but instead of being connected with the bell by electricity, it acted like a hair trigger, releasing a spring which was connected by a wire with a bell rung by mechanism; this alarm could be set to ring at any degree of heat, even by breathing upon it, which I saw done. Copper and iron were the materials used. I thought this an excellent safeguard, and one that no house should be without. It should be placed in the basement, where a fire may make such progress at night as to cut off the retreat of the family above, before they were awakened by it; but I have since heard no more of the device.

Having one of Holmes' burglar alarms in my house, I was desirous of having a fire alarm connected with it, and finding by Molesworth's tables that expansibility of zinc over iron was nearly three times greater than copper, I soldered a ribbon of tin and of zinc together; I made it fourteen inches long, and rolled it in a spiral form. One end was fixed in my basement, and one of the battery wires connected with it; the other end was free, and near to it the end of a wire, attached to the other battery wire. I have thus a very good fire alarm, large quantities of which might be made to cost not over two or three cents each.

I have read of a plan of distributing, throughout a store or factory, water pipes, perforated with many holes, so that the whole building or sections of it might be sprinkled in case of fire; I wish to suggest that, by using the Cedar street trigger arrangement, only the part where the fire was need be sprinkled. The supply pipe should run the whole length of the building or ceiling, with pipes leading from it across the room at moderate distances from each other, and each of them should be supplied with a detector or alarm to let the water into the one that had unusual heat under it, and at the same time ring a bell; but as all machinery is liable to get out of order, a night watch should not be dispensed with.

I do not know how long the use of the principle of the unequal expansion of metals, to show heat, has been known; but 30 or 40 years ago, Mr. Baure, a very skillful watchmaker in William street near Maiden Lane, New York city, showed me a thermometer which he had made, inclosed in a watch case, in which the degrees of heat were indicated by a hand moved by a small spiral ribbon of two metals, which he had soldered together. H. M. S.

Yonkers, N. Y.

Canal Boat Propulsion.

To the Editor of the Scientific American:

On page 259 of your current volume, a correspondent signing himself J. A. D. states that "Voyageur's" method of propelling canal boats is simply a reproduction of something old and, he furthermore make a suggestion which has the lack of originality which he attributes to "Voyageur." His proposition to use false sides running from the bow to astern of the boat to destroy the swell has been acted upon some time ago. The appliances, substantially the same as those which he mentions, were practically tested at Chicago over a year since, though not on a scale to warrant the assertion that the attempt would be as successful, in ordinary canal navigation, as in the experimental trial.

The sides extended along the length of the boat and a few feet astern, and were so constructed as to admit of their being raised to facilitate a free passage of the locks. The great width of such a boat necessitated an arrangement to adjust the false sides, and this feature alone was the only one that met with condemnation, as the awkwardness of the sides in working proved the impracticability of making them serviceable except when in position in the water. L. M. H.

Boston, Mass.

The August Meteors.

To the Editor of the Scientific American:

The August meteors amounted to but little at this point. I saw probably 50 or 60 up to 11 at night on the 9th, and somewhere about half as many up to the same hour on the 10th. On the 9th, nearly all made their appearance in a northeasterly direction and, apparently rising as they approached, vanished near the zenith. On the 10th, several passed from east to west and two or three from south to north, but the most had the same general direction as on the 9th.

Only two or three gave a red light with a small rocket-like trail; all the others gave white or yellow light and were apparently small, and all seemed to have a uniform rate of speed. A very few others were seen in other portions of the sky, moving in various directions, similar to those usually seen on summer nights.

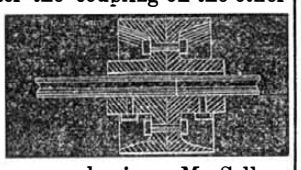
Louisville, Ky. W. L. DAVIS.

Transmission of Motion.

To the Editor of the Scientific American:

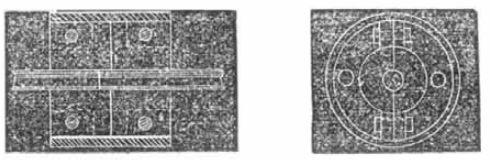
The lecture on the above subject by Mr. Coleman Sellers, as reported by you in your issue of October 19, is very interesting, as is everything that Mr. Coleman Sellers says on mechanical subjects, for it is always worthy the earnest consideration of mechanics. Anybody who knows the Sellers coupling knows that it is as near perfection in its way as anything can be, while at the same time the common plate coupling that he speaks of is not quite so bad as he believes, if it be only properly made.

Now the plate coupling can be made anywhere, and at any time, and is sometimes most convenient, as it does not require very nice fitting to make a comparatively good job, as Mr. Coleman Sellers thinks. He shows that, in order to keep the coupled ends of the shafts in line, the bolt holes in the plates must be reamed together and the bolts turned to fit. But that is not the way that good mechanics make the joint; they simply drill the holes large enough to take rough bolts, and let the end of one shaft enter the coupling on the other about $\frac{1}{8}$ of an inch, thus:



which keeps the ends in line; and there are also ways and means of tightening the couplings on the ends of the shafts not spoken of by Mr. Coleman Sellers, but well known to many mechanics. Mr. Sellers says that it is considered good practice even now in England to make the ends of shafting larger than the body parts, and to put the pulleys on in halves.

Now I have good reason to think that I know better what is good practice in England than our friend Mr. Coleman Sellers does, and his information in that respect is new to me. I could tell him what I saw as practised there 15 years ago, and that was a coupling made in four pieces, with an outer shell to cover the whole, thus:



Bricksbury, N. J. JAS. GARLAND.

Reckless Engineering.

To the Editor of the Scientific American:

The Springfield, Ill., Iron Company have just started a very substantial and convenient rail mill, supplied with the Siemens gas furnaces. The motive power is furnished by seven return flue boilers 3½ feet in diameter by 24 feet length, with two 15 inch flues, giving a fire surface of about 340 square feet each. They are set, four in one nest, with a steam drum running across them, and connected with each by the usual nozzle; two are similarly placed in another nest, while the last one stands alone. All are connected to one steam pipe, but each can be shut off. The one which stands alone has a three inch safety valve, which is evidently not large enough for its fire surface by nearly half its area; the two in the next nest are provided with one three inch safety valve also, and the four others are also supplied with but one safety valve of the same size; the pressure carried is one hundred pounds. This arrangement has worked well so far, because all the boilers together do not furnish steam enough to run more than half the mill, and four more are ordered. When steam is up, the 40 inch engine carrying the rail train is started; and when, after an hour or so, it drops to 40 pounds, the engine is stopped, and word sent to the firemen to open the furnace and breeching doors, when in about five minutes the pressure runs up to 100 pounds, blowing off violently. Now is there any excuse for such engineering in this age of cheap handbooks, by which any school boy may post himself on the rudiments, at least, of the science; and should not the least spark of common sense teach a man that a safety valve which may be sufficient for one boiler is not big enough for two, to say nothing of four?

But this is not all. In this mill, one of these boilers was tested by driving a plug into the hole where the safety valve should have been, putting a brace from there to the roof; and, without a gage on the boiler, steam was got up, when a visitor, getting a little scared, screwed on a gage and turned the cock, when the hand jumped to 60 pounds.

If any body can beat this for stupid and criminal carelessness and ignorance, I should like to know of it. Thus a hundred lives are constantly imperiled in this mill, to say nothing of the large amount of money invested; the latter, however, is of little consequence, for if capitalists will place their property in the hands of ignorant numskulls, they ought to suffer. This is either a case of penny wise and pound foolish, or one of misplaced confidence. I rather think it is the latter, for the directors of the company appear desirous of securing good men, and are said to pay liberal salaries.

A DISCIPLE OF WATT.

REMARKS:—A common English rule for area of safety valves, allows one half square inch for each square foot of grate surface with natural draft. The French law requires an area of $A=\frac{22{\cdot}5}{P+8\,62}$, where A= area in square inches per square foot of grate, and P= the pressure as indicated by steam gage. This is also adopted and recommended by the Committee of the Franklin Institute*. The United States regulations, as applied to steam vessels, require 20 square inches area for each 500 square feet of effective heating surface, or $A=\frac{H(eff.)}{25}$.

*Journal of the Franklin Institute, Vol. 51, p. 356.

Professor Thurston uses two formulas for general practice; one is based upon area of heating surface and the other upon the amount of coal burned per hour. They are. $A=\frac{4C}{P+10}$ and $A=\frac{5H}{2(P+10)}$. He prefers the former for all exceptional cases. In the first three formulas, A= actual area of valve in square inches, H= area of heating surface in square feet, C= coal burned per hour, and P= pressure per gage. Measured by either rule, the boilers described by our correspondent need a three inch safety valve to each, and we must agree with him that the case is one that calls for a thorough investigation and for the severest judgment upon whoever may be responsible for such professional malpractice.

The ordinary safety valve, as usually proportioned and constructed, is very defective; it rarely acts satisfactorily, and probably never rises so high as to afford an opening equal to the disk area of the valve. There are, however, a number of valves in the market which are vastly better than the common valve and not very much more expensive. Intelligent and conscientious proprietors and engineers cannot hesitate to adopt some one of them promptly, if they once realize the magnitude of the responsibility which rests upon them.

We have seen a marine engine suddenly stopped when steaming at full speed, the pressure being the maximum allowed, 25 pounds by the gage, and have seen the safety valve rise at 27 pounds and yet fail to check the increase of pressure until the gage showed 37 pounds above the inspector's test, in spite of every effort on the part of the engineer to check the formation of steam by opening doors and pumping cold water into the boiler. Can the continued use of a valve of such construction be in any way justified? The valve referred to was of the full area required by law, but, like all ordinary valves, could not be given full opening by any safe over-pressure of steam.—EDS.

The Ellis Vapor Engine.

To the Editor of the Scientific American:

I have interested Mr. Corliss and the Corliss Steam Engine Company of this place in my invention, and they are erecting a 40 horse power Corliss engine to be worked as a vapor engine on my plan, to drive the blowers for their foundery. It is to be arranged so as to give the matter a most careful test in the most economical class of engine, and is to be especially arranged so as to give the most accurate results as to amount of coal consumed and power developed, both by the steam and the vapor cylinders. All is to be done under the personal superintendence of Mr. Corliss himself, which will, I trust, make the result satisfactory to engineers throughout the world and to yourself. I will avail myself of your kind offer to publish the result of such a trial; and I will send you the original copy of the results, with diagrams, etc., verified by Mr. Corliss and his engineers, as soon as they are completed, whatever they prove to be.

Providence, R. I. JOEL A. H. ELLIS.

Explosions of Benzine.

To the Editor of the Scientific American:

You made mention some weeks since of an explosion of benzine which was being used by some men cleaning machinery, and it called to my mind a case that happened some years since. Two men were in the midst of an explosion of benzine gas; both died some days after. I visited one of them after death. The skin came off all over his body, excepting where a broad leather belt was around his loins. About two days after the explosion happened, he was lying on his back and said there was fire under him. The attendants examined and found the bed clothes on fire; and we concluded that gas was coming out of him, and that the heat of his body caused combustion.

Cleveland, Ohio. WILLIAM WARD.

Ball Lightning.

To the Editor of the Scientific American:

In your issue of September 28, on page 196 current volume, C., of Cleveland O., has a letter averring that he witnessed, from an elevated position, the phenomenon of ball lightning as it passed from one cloud to another. C.'s observation is not to be disputed, for almost every one has frequently seen essentially the same thing; but his conclusion cannot be proved so satisfactorily. A dazzling light accompanied by a loud report is not always lightning, else its exhibition was alarmingly frequent during our late unpleasantness.

A meteor coincidental with the storm has been mistaken by your correspondent for a peculiar display, or, perhaps, according to his judgment, for a peculiar kind of lightning.

Shreve, O. M. D.

[For the Scientific American].

Concerning the Nature of the Hydrogen Atoms in Benzol, and of the (SO^2OH) Group.

The object of the author in the following researches was to determine, so to say, the "sex" of the successive H atoms in the important radical benzol. Their nature, in the case of the fats, where the C atoms are little, if at all, coupled with valences with each other, has already been exhaustively investigated, experiments having shown that, upon the displacement successively of the H atoms by a negative element or molecule, the radical finally becomes so essentially "soured" as to assume the character of an acid of the hydrochloric type, its H being replaceable by a metal. For example, hydride of methyl, CH_4, may be cited, where, upon the displacement of three of the H atoms by the strongly negative group NO^2, the resulting nitroform $CH(NO^2)_3$ readily exchanges its H for a base. Now to determine whether this were equally true of the "aromatic series," I chose the sec

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ond of the bromine substitution compounds of benzol ($C_6H_4Br_2$) and replaced successively the fourth and third H atom respectively by the strongly negative groups (NO^2) and (SO^2OH), giving a finely crystallizing acid of the formula ($C_6H_2Br_2(NO^2)(SO^2OH)$). Now in theory this acid should be bibasic in its nature, the second H atom of the original benzol and that of the (SO^2OH) group being both replaceable by bases. Experiment denies this, *in toto*; salts of the acid with the most powerful + elements, K, Na, Ba, Sr, Pb and Cu, presenting on analysis the formula $C_6H_2Br_2(NO^2)(SO^2OH)$ proving conclusively that the displacement of the H atoms in a compound of the aromatic series by a + element is impossible. Concerning the nature of the SO_2OH group, these investigations lead to the inference that it possesses but little negative influence, in a compound, at least, so thoroughly saturated with + C as benzol.—*Rich. Douglas Williams, Ph. D.*

[For the Scientific American.]

ON CERTAIN UNDESCRIBED PROPERTIES OF THE CONCENTRATED SOLAR RAYS.

By George Robinson, M. D., Fellow of the Royal College of Physicians of London.

Some thirty years since, I accidentally noticed that the sun's rays, concentrated by an ordinary lens and directed upon the hand immersed in water, produced immediate pain with burning heat and vesication. This experiment, varied and repeated at intervals on different living animal tissues and under different circumstances, always led to the same result. But if the concentrated rays were fixed for an instant upon the head of a small aquatic animal, death immediately resulted before vesication occurred. On dead animal matters similarly treated, no perceptible effect was produced.

The physiological action was, as I have stated, always instantaneous but when a thermometer having a bulb of black glass was immersed in water and the rays concentrated on the bulb for some time, the instrument at the end of ten minutes only indicated a rise of temperature from 60 to 80°. A few years since I happened to mention these observations to my venerated friend, the late Dr. John Davy, and at his request I prepared a short account of them which he communicated to the British Association for the Advancement of Science, at its meeting in 1867.

The rationale of the results witnessed in this simple experiment always seemed to me obscure, and to indicate the possible existence in the sun's rays of some property or force that had not hitherto been investigated. Under this impression and being myself engaged in practice, I took advantage of an opportunity to draw the attention of the illustrious Faraday to this subject some fifteen years since, in the hope that he would apply his powerful mind to its elucidation. But in a kind letter, he told me that he was then overwhelmed with work and could not undertake the inquiry.

Happening to be in New York during the recent hot summer, I have performed a few additional experiments; and so far as they go, they certainly tend to confirm my belief in the existence of a hitherto unrecognized property or force in the solar rays.

In attempting to ascertain the precise nature of this force, I could not rely on ordinary thermometers, for they are actuated gradually and slowly while the pain and sensation of heat are instantly felt. Neither would the usual thermo-electric apparatus meet the difficulty, as my observations must be made in water as well as air. I finally concluded to rely on Nature's own instrument, the nerves of sensation as they exist in exquisite perfection in the integuments of the finger. In the propriety of this course, I was confirmed by a remark of Professor Tyndall that the optic nerve is more sensitive to the heat rays present in light than any thermometer.

In experimenting, I generally placed on the end of the forefinger of my left hand the substance under observation, steadying it with the thumb, and dipping the hand when necessary into water so as to have a layer of that liquid at least an inch thick above the skin. The lens employed was of 7 inches focal distance; and in using it, I always threw the focus behind the object examined so that the rays should traverse it instead of being concentrated upon it.

Whenever in experiments in air there was the slightest appearance of singeing or other action of heat on the substance examined, the observation was rejected. Care was taken not to press the finger firmly against the substance, but merely to maintain the slightest possible contact. Under these conditions, a burning painful sensation was felt when the concentrated solar rays were transmitted through the following substances both in water and air, namely, two layers of blue glass, black leather (glazed and unglazed), green leaves, thick white card board, the same covered with blue or red paper, six layers of pink paper, earthenware, oil clot hand common brown glue a quarter of an inch thick.

Now taking only these substances into consideration, it is, not easy to explain on the views now current how rays could pass, through an opaque non-conducting substance like oil-cloth, so as to pain the finger placed beneath it even when both were immersed in water. But my observations came still more into collision with received opinions. Thus it is generally stated in scientific works that a crystal of alum is athermanous, that while allowing the rays of light to freely traverse it, those of heat are arrested. But on directing the concentrated rays through a crystal of perfectly transparent alum, I found that it produced a burning sensation in the skin both in air and water. It is evident therefore that Melloni's conclusions with reference to athermanous bodies do not apply to the concentrated solar rays, if the pain were produced by heat. Another still more curious and unexpected result was obtained. It is generally believed that metallic surfaces reflect heat rays of all degrees of refrangibility, and are consequently impenetrable to them and absolutely athermanous. But I found that a burning heat was felt in the finger when the concentrated rays were transmitted through double tin foil and thin sheet iron. The following experiment illustrates this point very clearly: I took a mirror formed of plate glass a quarter of an inch thick, silvered in the usual way with tin amalgam, on the back of which was a thick layer of red paint, well dried. I let the painted back part of the mirror rest upon my finger both in air and water; and on concentrating the rays upon the glass, throwing the focus as usual behind the mirror, the burning pain in the finger was instantly felt by myself and others. The mirror itself was in no way affected by the experiment.

Here the light rays were of course excluded and those of radiant heat were, according to the generally accepted laws of physics, prevented from penetrating to the finger by the tinervening metallic coating of the mirror, to say nothing of the layer of red paint; and yet rays capable of producing pain and inflammation in the integuments of the finger undoubtedly passed through, 1, the water, 2, the thick plate glass, 3, the layer of tin amalgam, and 4, the coat of red paint.

Now what were these rays?

They were very refrangible, they possessed great penetrating power, they acted instantaneously and energetically upon the tissues of the living animal body. These are obvious and palpable conclusions, but without additional facts we cannot go much further in reasoning on the subject.

That the concentration or mere convergence of the sun's rays does really increase their penetrating power is, I think, highly probable, and this may partly explain some of the facts observed. But I still cling to the belief that the conditions present, for instance in the last mentioned experiment, rather point to the presence in the sun's rays of a force acting specially and as a powerful stimulant or irritant on living matter. It may be that the more refrangible heat rays thus exercise on vital structures a special influence analogous to the actinic or chemical power of the more refrangible rays of light. I append other experiments, which also tend to render it probable that the irritation and pain in the living tissues, observed under these circumstances, are not induced by common heat. Ordinary albumen being coagulated at a temperature of about 150 F. might, I thought, serve as a test of the presence of common or thermometric heat in the sun's rays, and so assist in determining the question whether the burning pain was really due to heat or to some other force.

Some perfectly transparent egg albumen, placed on glass or on white earthenware, was not at all changed by the concentrated sun's rays; on any dark surface, however, it was instantly coagulated, and this effect occurred both in air and water. Thus when poured on dark purple paper and the rays concentrated upon it in the slightest degree, the albumen presented at once an opaque clot.

I took some of this purple thick glazed paper, and wrapped it round my finger. On the purple surface, I placed some albumen, and on the latter, a second layer of the purple paper. I then carefully concentrated the sun's rays so as to avoid burning or injuring in any way the paper, throwing the rays through it and the albumen; I instantly felt the burning pain in the finger, and then withdrew the lens and examined the albumen placed between the two layers of purple paper. *It was not at all coagulated.*. Here the irritating rays passed through two layers of purple paper and a film of albumen without producing any effect on those substances, but instantly caused pain in the skin beneath. A little of the same albumen placed upon the same paper was at once coagulated by the same condensation of the sun's rays, so that, if any rays of heat had passed through the first layer of paper, they ought to have produced coagula in the albumen resting upon the second layer of purple paper. As they did not do so, the probability is that the pain was not occasioned by ordinary heat.

In another experiment the mirror above mentioned was placed upon the finger, a layer of egg albumen intervening between the skin and the back painted surface of the mirror. The rays were then gradually concentrated upon the upper glass front of the mirror until a burning pain was felt in the finger beneath the latter. The albumen, being then examined, was *not* coagulated.

In leaving this subject for the present, I shall merely remark that the phenomena of "sun stroke" are probably due to the peculiar rays producing the pain and other physiological and pathological effects noticed in my experiments. This inquiry may therefore not be without some practical interest to the members of the medical profession.

In the hands of more skillful investigators, aided by the refined scientific appliances of the present day, there is every reason to hope that the obscurity still surrounding this subject will be dispelled, and that we shall hereafter be enabled to recognize more fully the nature of the intimate and beneficent connection undoubtedly existing between the solar and vital forces.

New York: October, 1872.

Electrical Batteries.

Mr. E. G. Bartholomew lately read a paper on this subject before the Society of Engineers, London.

The author said he has always regarded it as an apt illustration, to draw a parallel between the electric telegraph and the steam engine. The conductor may be compared to the steam pipe; the one conveys the electricity from its source, the battery, to act upon the instrument: the other conveys the steam from its source, the boiler, to act upon the engine. Again the instrument will bear a strict comparison with the engine, for both are mere machines constructed in such a manner as to be best influenced by the power conveyed to them. There then remains, in either case, the source of power. Now, what a steam engine would be without the boiler, a mere combination of inert pieces of mechanism, the electric telegraph would be without the battery. For this reason it has been thought that the battery forms a subject worthy of a separate notice.

The progress of telegraphy may indeed be regarded as dependent in a large degree upon our knowledge of the battery.

The identity of electricity, from whatever source derived, whether from the friction of certain substances, from evapoation, from the chemical action set up under certain conditions, from magnetism, or from heat, is not doubted. It may differ in degree but not in nature. If it be true, as has been asserted, that when we eat an egg with a metal spoon we generate electricity, the electricity so evolved will be identical with the flash which rends the oak. And certain substances, and certain combinations of substances, afford greater facilities for the development of the force than others; and it has been a part of the study of the modern philosopher to ascertain by what means the greatest amount of electrical force can be obtained at the least possible cost. The well-known story of Galvani's accidental discovery of a force hitherto unsuspected requires no repetition here, nevertheless, we are bound to ascribe to him the honor of finding that certain metals when converted by a fluid would develope electricity; and when Volta subsequently produced a real battery by examining the laws of production and multiplying the combinations, he only followed in the path his predecessor had indicated.

The simplest voltaic combination is that in which two metals, as copper and zinc, having different affinities for oxygen, are immersed in a liquid capable of oxidizing one of them. Under such conditions a current of electricity is generated upon the surface of the most oxidizable, and, passing through the liquid, is given off at the other metal; and if a wire connect the two plates the current will continue to flow through it, from the receiving to the generating plate, so long as the necessary conditions are fulfilled.

It has been ascertained that those metals or substances which differ most in their affinity for oxygen will form the most powerful combination. The order of the substances is as follows:—Graphite (carbon from gas retorts), platinum, silver, copper, iron, lead, tin, zinc. Hence a combination of graphite and zinc forms a powerful battery, and, as both substances are comparatively cheap, this form of battery is of frequent occurrence. The great desiderata in a battery required for telegraphic purposes are its ability to overcome R (or resistance) and its constancy in action. The power a battery possesses of overcoming R is called electromotive force.

There are two distinct characteristics in a battery, dependent upon the order in which the same combinations are arranged; thus, if one pair of large plates, say 12 inches by 12 inches, be employed, the quantity of electricity generated will be considerable, although the electromotive force will be small. If, however, a similar pair of plates be cut up into 144 pieces 1 inch by 1 inch, and the 144 combinations be so arranged in 144 separate cells as that the — plate of the one be connected with the + plate of the next, and so on throughout the series, a battery is then obtained possessing 144 times more electromotive force. Its latter property is termed its tension, and is applied to the entire series, the electromotive force being more strictly applied to the specific energy of each combination.

Where great energy is required, the Grove battery becomes the most valuable of all combinations. In this arrangement amalgamated zinc and sheet platinum are employed, separated by a porous diaphragm. The zinc stands in a strong solution of acid sulphur, and the platinum in pure nitric acid. The action is as follows: The hydrogen element of the decomposed water, instead of passing over to the collecting plate and forming upon its surface, is entirely suppressed by the nitric acid, which becomes slowly deoxidized and converted into nitric acid, which passes off in dense red fumes. This is a serious drawback to the use of this battery.

One of the most valuable batteries for telegraphic purposes, where a constant current is not required, is the Leclanche. It consists of a zinc rod placed in a solution of common chloride of ammonia (sal ammoniac), in which stands a porous pot containing a piece of carbon surrounded by a mixture of gas carbon and a peculiar form of peroxide of manganese broken into small pieces, but separated from any powder. When the battery is in action, chloride of zinc is formed. When the sal ammoniac has become nearly removed from the liquid, it cannot dissolve the chloride of zinc, and the liquid becomes milky; more of the salt must then be added.

In a battery consisting of many plates in a series, all the plates should be of the same size, and all the cells in the same condition, as one faulty cell will not only rob the entire series of the value of itself, but will injure the action of the whole. Every cell of a battery should therefore be periodically tested separately, and, if the quantity of any one cell be less than the average of the others, it should be rejected or remedied The battery itself, although the source of power, yet possesses resistance to the passing of its own current.

It is interesting to find that the so-called silver mines of Athens, from the profits of which Pericles is said to have built the Parthenon, are now attracting special attention. The mines of Laurium are some veins of argentiferous galena running between the mica schist and limestone formations of the promontory of Laurium, stretching from Sunium to Athens. From the remains of the ancient workings, there are now being obtained about 9,000 tuns of bar lead, lowered in value by being very antimonial, which contains above ten ounces of silver to the tun.

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FLEXIBLE PIPE COUPLING.

In order to render the large pipes, which are employed to carry a supply of water across (or rather under) rivers or streams, flexible, so that they may rest throughout the entire length on the uneven surface of the bed, it is necessary to construct them in sections united by universal joints. The mode of coupling generally used is the ball and socket. One end of each section is turned and bored into a cup-shaped socket, into which is inserted the globular extremity of the succeeding portion, which is retained in place by lead poured into suitably arranged grooves. The metal, hardening, prevents separation of the sections and, at the same time, does not interfere with the free play of the joint. The objections urged against this method are: the leakage, due to the lead not forming an adequate packing, the necessity of machine shop work in the boring and turning of the sockets and balls, the difficulty of repair, necessitating the lifting of the pipe, and much labor in the formation of new joints and the substitution of perfect sections for those that become deteriorated.

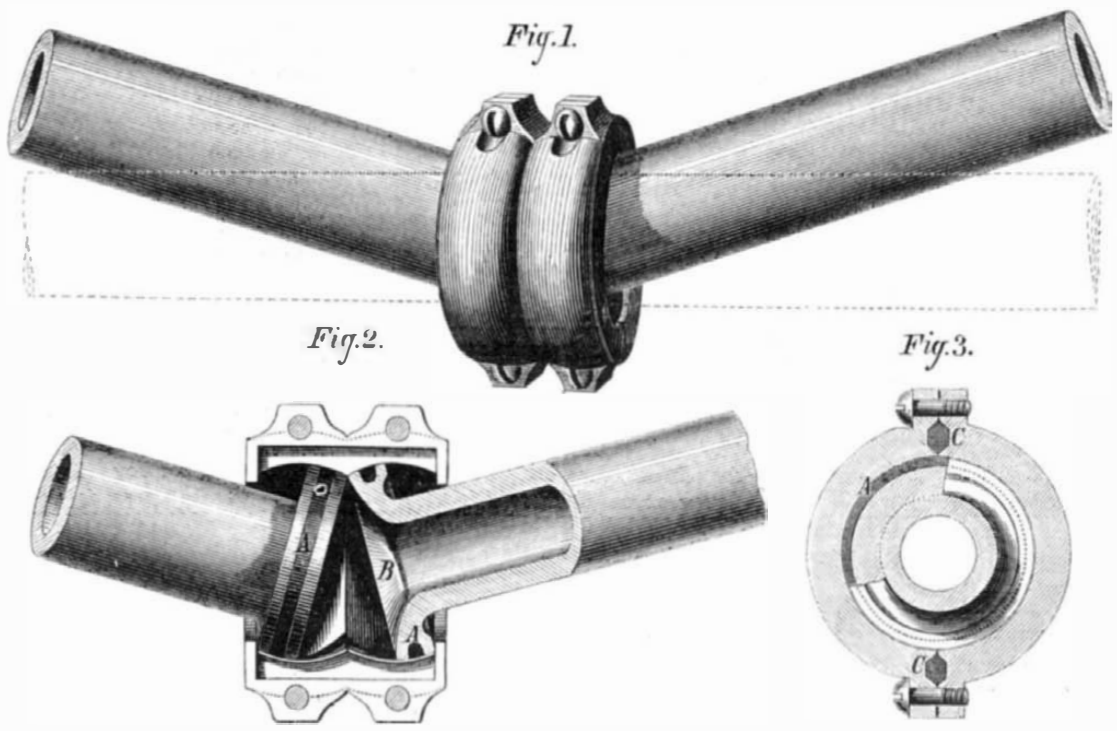
In order to avoid these disadvantages, Mr. William Kearney, who, our readers will remember, is the inventor of the excellent form of grate bar described in a recent issue of our journal, has devised a new method of coupling, which we illustrate in the annexed engravings.

Fig. 1 shows the pipes connected, and also the amount of flexure of which the device admits—the dotted lines representing the tubes when straight. Fig. 2 is a longitudinal, and Fig. 3 a transverse section, showing clearly the interior arrangements. Both ends of each section are cast with flanges, a process which at once obviates the expensive operations of boring and turning. On the edges of these flanges are cut grooves, shown in section, which are filled with suitable packing, as at A, Figs. 2 and 3. The faces of the flanges are flared outwards so as to gradually widen the interior orifice, as is represented at B, Fig. 2. The extremities of two sections, being brought together, are placed in a metal box, cast in halves and of the shape shown in Fig. 1. From the interior of the box (Fig. 2), it will be seen that two annular chambers are formed, in each of which one end of either adjoining section of pipe freely moves, the joint being made water-tight by the packing on the flanges. The two halves of the box, one of which is below the tubes and the other above, when in position, are held firmly by the four screws, as shown, and their point of contact is made impervious to water by packing placed in the grooves represented at C, Fig. 3.

If the reader will now, in looking at Fig. 1, consider that he has descended to the bottom of the river as a diver, and is regarding the upper side of the coupling as it lies on the bed, it is plain that in the event of a leakage on the under side, which, as we before stated in the old mode of connection, would necessitate the raising of the entire tube, he has only to remove the screws and take off the upper half of the box, and the ends of the pipe are free to be repacked or otherwise made tight; or, by disconnecting another coupling, the entire section may be lifted out and a new one substituted. This advantage is so obvious that we think no further explanation of it necessary.

The double annular chambers in the interior of the box, in connection with the flaring of the ends of the pipes, insures a greater delivery of water, by preventing the opening between the tubes from being rendered smaller by the bending of the sections at considerable angles to each other—an unavoidable defect in the ball and socket arrangement, where the parts have square edges and necessarily come in close contact. As to the cost of this coupling, as compared with the first mentioned and older device, we are assured by the inventor that it is less. He states that the expense of the lead and the boring and turning is much greater than that of the extra metal required and the manufacture of the simple castings; while the advantages in facilities of repair and ready connection, he justly considers, turn the balance largely in favor of his invention.

Patented January 9, 1872. For further particulars address the inventor, Wm. Kearney, engineer of the Jersey City water works, Belleville, N. J.



KEARNEY'S FLEXIBLE PIPE COUPLING.

A VERY common preventive for boiler scale used in this country is ground logwood, a little of which placed in a steam boiler is very serviceable. A new preventive is announced in England, to wit: the leaves of the bearberry, a wild trailing plant common in this country and also found in England and Scotland. The leaves are said to contain gallic and tannic acid.

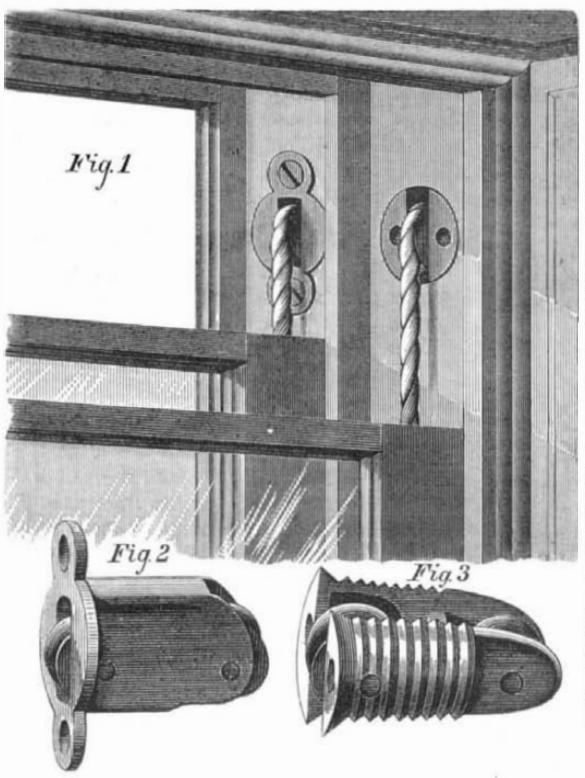
THE centenary of Linnæus's death will be celebrated at Stockholm on the 10th of January, 1873, when a statue of the great Swedish naturalist will be unveiled. He died at Upsala (in the university of which city he was for many years Professor of Botany) in the sixty-eighth year of his age.

Novel Use for a Balloon.

Mr. Samuel A. King, the well known Boston aeronaut, was recently employed upon a novel commission, that of measuring with balloons the discharge from a gas well in Ontario county, New York. The well is owned by a company of capitalists, and the gas is conveyed in pipes to Rochester, twenty-six miles distant, and there mixed with the street or illuminating gas. The flowage reached only 25,000 feet a day, when the capacity was estimated at 800,000. With two balloons, one of 20,000 cubic feet, and the other of 13,000, the exact capacity of which was previously ascertained to a nicety (says the Boston *Journal*), Mr. King measured the flow for a certain period, and the result showed that the flow was about 4,000 feet per hour. Much of the gas is thought to escape by leakage from the pipes between Bloomfield and Rochester. In accordance with Mr. King's suggestions, the Company propose to perfect the present drill hole and sink another near the first. The gas was discovered many years since, while parties were boring for oil, and when it first escaped the tools were driven out.

SASH PULLEYS.

The accompanying illustrations represent two new improved forms of sash pulley. Fig. 2 shows the device known as the "Builder's Favorite," consisting of a metal box containing two wheels, which are drilled smooth and run on wrought iron axles. The pulley is easily and firmly adjusted to the window case, as no mortise is required and the work of setting is entirely done with the bit. To the left of Fig. 1, it is shown in place and also the mode of attachment by screws through holes in the outer plate. Fig. 3, called the "Universal Sash Pulley" is an iron shell, on the outside of which a screw thread is cut. Within are two wheels arranged in a similar manner to the invention above described. A fork wrench and common brace are all the tools needed to insert the appliance into either an iron or a wooden window frame, where, being firmly screwed into place, it remains fixed. It is shown in position above the right hand or lower sash in Fig. 1. The friction of the cord over the wheels is comparatively nothing, so that it will last for years.



Both devices will be seen to be exceedingly simple and free from springs, ratchets, catches or locks. They can be inserted and permanently secured, it is claimed, in much less time than is required to place other pulleys, while their durability is ensured by their construction. Patented June 29, 1869, and December 28, 1869. For further particulars address the manufacturers, the Lakin Manufacturing Company, Westfield, Mass.

Fish Culture in the United States.

A convention of the New York State Commissioners of fish culture was recently held in this city. Professor S. F. Baird, the United States Commissioner of Fish and Fisheries, gave an account of his administration of the trust committed to him, namely, the propagation of useful food fishes in the waters of the United States. He stated that Mr. Seth Green had succeeded in planting several thousand young shad in the Alleghany at Salamanca, and a large number in the Mississippi above St. Paul. Mr. William Cleft has also placed about 400,000 fish in the first mentioned river, as many more in the White River at Indianapolis, and the balance of his stock in the Platte River, near Denver, Colorada. And Professor Baird further said that measures had been taken for stocking American waters with salmon eggs. About 600 large healthy salmon are now in an enclosure staked off in the center of a pond of 150 acres. From these fish the eggs are to be taken at the proper time and impregnated, the salmon themselves then to be again set free. It is expected that millions of eggs will be thus secured.

Through the influence of the Deutsche Fischerei Verein, in Germany, the German government has offered to present to the United States a quarter of a million of eggs of salmon from the Rhine, which, with as many more purchased, also in Prussia, will soon be received. The endeavors to obtain eggs from the rivers of California have been partially successful, about 15,000 eggs being collected during the season.

MANGANIFEROUS IRON.

In the Bessemer process the use of spiegeleisen plays, as is well known, an important part; on the one hand it serves for carbonizing the iron, on the other it improves the quality on account of the manganese it contains. Two properties, therefore, render spiegeleisen of special value; first, its constant large amount of carbon, and, secondly, its great percentage of manganese. It is only by adding a definite quantity of spiegeleisen to the iron to be worked that a definite carbonization and the desired degree of hardness can be obtained; while the large proportion of manganese insures an abundant formation of slag and thus purifies the pig iron subjected to the process. Of late, this last requirement has become of special importance, as coke pig iron may be now treated by the Bessemer system; and coke—made iron is, as is well known, much more impure than charcoal iron, as it often contains much silicon. In England, where coke iron is chiefly used for the making of Bessemer metal, the price of the manganiferous spiegeleisen varies according to its percentage of manganese. Where, however, it is used for the carbonization of charcoal pig iron, it is not necessary to have a larger percentage than seven or ten per cent. Formerly, spiegeleisen was produced from highly manganiferous ores, and at Siegen, on the Rhine, where this industry is concentrated, spiegeleisen with eight per cent of manganese is considered indispensable in all Bessemer works.

It has long been known that, if a mixture of iron and an oxide of manganese be melted, together with a proper reducing agent, alloys of iron and manganese of any proportion may be produced; in short, an artificial alloy renders the same service in the manufacture of manganiferous iron as the naturally occurring ores do, and such a product is even more available, as it may be brought to any quality required. Through one of our German exchanges, we learn that a company has been formed in Jauersberg, Austria, and is now actively engaged in the manufacture of these alloys. Von Hauer, in Vienna, has analyzed these samples, and found them to contain from twelve to fourteen per cent of manganese, a proportion which had been guaranteed by the company. This is a proof that the operative chemist has the proportion under perfect control. The amount of carbon averaged five per cent. As the new product exhibited a less lamellar structure than the spiegeleisen from Siegen, it was at first received with some distrust; but now it has become the object of considerable demand, since chemical analyses, as well as practical tests, have proved without doubt that it answers all reasonable expectations.

To make yellow wax into white wax, the former is boiled in water, spread out into thin layers, and exposed to the light and air. This is repeated until all the color is gone and the wax remains pure and white.

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THE ANTIQUITY OF MAN.

If a hundred years ago a *savant* had expressed, in a company of his peers, the opinion that the earth was a million of years old, he would have been laughed at; and if only twenty years ago a geologist had, in a similar assembly, asserted the great antiquity of mankind and the existence of fossil men, he would have been considered to be incredulous in religious matters and over credulous in regard to geological evidences. The general opinion that the diluvial age and the modern period were characteristically distinguished by the appearance of the human race could not, 20 years ago, be shaken; but now there is scarcely any geologist left among us who doubts the existence of man during the end of the glacial period, or at least immediately after the same.

It should be kept in view that, for the geologist, when there is question concerning the nature and habits of the fossil men, neither traditions, written histories, nor pictures of ancient civilized peoples can give any information. The oldest among the traditions or writings give us scarcely any information for a period of 6,000 years; while in regard to pictorial relics, even the highest estimates allow a maximum of only 12,000 years. But what is 6,000 or 12,000 years for the geologist, who measures the period of the carboniferous era alone by millions of centuries?

Therefore, in order to obtain information in regard to the history of primitive man, we are reduced to the geological records, investigated and explained according to true philosophical methods. Such geological evidence we find, besides the somewhat rare human skeletons, especially in the tools, remnants of food, kitchen utensils, and other indestructible traces of man's presence and activity. Rude contrivances or arms to subjugate the animals surrounding them, and to procure food for themselves, were in the possession of all primitive races, in whatever savage condition they may have existed; and many important conclusions may be drawn from their appearance.

It is evident that, in all investigations in which there is question of the primitive history of our own race, we should proceed with the utmost care, so as to avoid errors; because this question is closely related to those concerning the highest spiritual interests of mankind. This praiseworthy prudence is therefore the cause that, in former years, all records of diluvial traces of man were treated with mistrust, and that there existed an inclination to consider such remains as having reached the diluvial strata by mere accident. So the report of Pastor Esper, who, in 1774, dug human bones (among those of the fossil cave bear) out of the Gailenreuther cave, was not noticed; and a similar fate befel the records of the English archæologist, John Frere, who in 1797 found, in the diluvium of Suffolk, arms made of flint. The report of Ami Boué, who in 1823 found, in the bluffs of the Rhine valley in Baden, a human skeleton, was also neglected; and no notice was given to the communications of the French archæologists and geologists Tournal, Christol, Joly, and Marcel de Serres, concerning several bones of new fossil animals (found in different caves) which had been worked and fashioned by human hands, as well as flint implements found among the bones of these now extinct animals, in the caves of Southern France. It must be acknowledged that several of the above reports could easily be objected to by reason of uncertainties in the observations and the vagueness of the conclusions drawn. But it is almost unexplainable that investigations of exemplary accuracy, such as those of the Belgian geologist Schmerling, remained so long in oblivion. This conscientious investigator had, in 1833, the caves of Engis and Engihoul, near Liège, emptied of their contents, and watched personally, with several witnesses, the labor, for many weeks and with the utmost care. He described afterward in, a large atlas, all the objects found; among them were two human skulls and many flint implements, all found mixed with the remnants of the cave bear, cave hyena, etc. At last, all doubts were resolved by the facts furnished by Boucher de Perthes, in Abbeville. High above the present valley of the Somme in Picardy, existed undisturbed layers of diluvium, with remnants among them of the mammoth, rhinoceros, cave bear, cave hyena, etc., relics in short of the whole *fauna* which inhabited Europe during the glacial period. In the middle of these primitive animal remains, De Perthes, as early as 1833, found near Abbeville the first few speciments of flint arrowheads, hatchets, knives, etc., and he afterwards discovered many hundreds of the same. Moreover, many of the fossil bones had been evidently cut and scraped by means of these flint tools. But, singularly, it was not till 1863, thirty years after the first discovery, that Moulin Quignon found a lower jaw and several other human bones at the same place.

This last discovery made some commotion. A small congress of English and French geologists assembled in order to inspect the locality which had yielded human bones from the deposits of the diluvial period. After Boucher de Perthes and Sir Charles Lyell, in his celebrated work on "The Antiquity of Man," had drawn the attention to these prehistoric human remains, similar discoveries have succeeded one another continuously. Flint tools, similar to those of Abbeville, were found in caves with the bones of the diluvial mammalia. Near Aurignac, in the Haute Garonne, the exploration of a rabbit hole by boys led to the discovery of a large grave, closed with a stone slab; inside this tomb 17 human skeletons were found, together with implements of flint and reindeer horn, and several fossil men. In front of the cave was a hearth, on which were numerous broken and half burned bones of the giant deer, reindeer, cave bear, rhinoceros and other animals; many productions of human art were also found. Unfortunately the mayor of the place had the human bones buried in a cemetery, where, some years afterwards Lartet could not find them. This was much deplored by some investigators who were very anxious for details concerning the skeletons of our most ancient ancestors.

Two skulls, one from the Neander cave near Dusseldorf and the other from a cave near Liège, appear to show an inferiority in the development of the brain; and a similar formation is the case with the recently discovered five skeletons in a railroad cutting in the department of Dordogne, France. Among these is one of a woman and one of a child; the male skeletons are, in size and power, far superior to the French now inhabiting that locality. The faces are very broad, and prominences for muscle attachments very large. In regard to the mental culture of our ancestors, these discoveries suggest very sad reflections. The male bones show traces of fractures and wounds, while the female skull has been cracked by a stone hatchet.

Our readers may be desirous to know something about the chronology of the events, the relics of which we have noticed. Lyell estimated, some 10 years ago, the antiquity of man at 150,000 years or more; but we know now that the glacial period ended more than 200,000 years ago; and that man, with the reindeer, which retreated north, was already in existence at its termination.

THE VIENNA EXPOSITION.

"The preparations for the exposition of the art and industrial products of the world at Vienna are on the largest scale. Some idea of the importance of the undertaking may be gathered from the fact that the building itself will cover six times the space of the Palais de l'Exposition at Paris. In addition to this, strenuous efforts are being made in all countries to secure a complete representation of art and industrial products. The various systems of public instruction will be contrasted, and we hope that the result will not be unfavorable to our public school system. On account of Congress having made no appropriations, the representation of American manufactures will not be so large as might be desired; but as the exhibition of goods is a form of advertisement, we see no good reason why the public should be called on to pay for the transportation of goods belonging to a wealthy corporation. Unless exhibitors believe that the exposition of their wares is likely to be sufficiently profitable to justify them in incurring the expense of transportation, we do not feel called upon to pay their advertising. At the same time we wish the exposition all success, and desire that American industry should be properly represented; but those who reap the profits ought, in justice, to pay the expenses."

The above from the *New York Herald* is sensible and meets the case. Private individuals who desire to show their goods at Vienna or any other exhibition ought to pay their own expenses; Congress did a good thing last year in refusing to appropriate the public funds for this purpose. But an attempt will probably be made, on the assembling of Congress, to revive the subject and procure money. The poor advertisers alluded to by the *Herald* want their board paid by Uncle Sam, as a matter of course; then there is General Van Buren, the United States Commissioner for this show, who will also come in for emolument. At present his office is purely honorary; he draws no pay, and knew that when he accepted its functions. But of late he has been very arduously engaged in his exhibition duties, stumping eloquently around the country to urge the election of General Grant, and the administration will, of course, be expected to provide handsomely for his trip to Europe.

We have heard it stated that some fifty thousand of our citizens annually go abroad, taking out of the country from ten to twenty millions of dollars. The Austrian show will, in any case, take an immense amount of money from the pockets of our people, and the sum ought not to be swelled by appropriations from the national treasury.

LIFE-SAVING INVENTIONS NEEDED.

Another terrible disaster at sea has happened, which, for loss of life and property, surpasses the Metis, Bienville, America and Nevada calamities. The Atlantic mail steam propeller Missouri; *en route* from New York to Havana, was, on the 22nd of October last, while near the Island of Abaco, one of the Bahama group, completely consumed by fire. The vessel was 1,180 tuns burden and built in 1862; her cargo was valued at 500,000 dollars. Seventy-six lives, including those of the captain and entire crew, were lost, and only twelve saved. Of the six boats that were launched, three were instantly swamped, two were burned alongside the ship, and one, through the heroism of a passenger, reached the shore in safety.

It would be supposed that the awful lessons of the wrecks of the past few months would have served as warnings, to the owners of sea-going vessels, to make, by the best attainable means, adequate provision for the safety of the lives entrusted to their care. Yet from the details of this last horror, briefly given in the telegraphic despatches, it is shown that there was no preserving apparatus at hand, and that the ordinary appliances for the rapid and safe lowering of the boats were entirely absent. Moreover, the boats themselves were of the common wooden construction and in the hands of the crew who were totally uninstructed and unskilled in their management, failed, as might be expected, to live in the rough sea that was running.

It is high time that proper life-saving inventions were placed aboard our passenger steamers. Rafts, of trunks, of mattresses, of state room doors, have been devised, tried, and found wanting. The first heavy sea tosses them about so that it is impossible to cling to them, much less to maintain a footing on their surface. Boats, unless handled with consummate skill, capsize almost immediately when crowded; and the only means of any value, which is available when the vessel is stranded, is the life line and traveling casks, in which crews have often been transported ashore in safety. The records of past shipwrecks show that boats and rafts have been kept afloat for some time in heavy weather, by attaching them to a number of spars lashed together, and allowing them to ride to the latter as a sea anchor. The spars form a sort of breakwater, and in a measure reduce the force of the waves. Again, the simple cask weighted at the bottom, to keep it from rolling over, in which a person may be inclosed, has been proved of great efficiency. Now, cannot some inventor combine both casks and spars, and devise a life-saving apparatus that will sustain a number of persons and yet be practically safe? The necessity is most urgent, and it is inexplicable that, in a country where so large a portion of the population live on the seaboard and are familiar with maritime affairs, that no one has succeeded in bringing forth a really trustworthy and efficient plan. We sincerely trust that inventors will now need no further appeal to turn their best energies to this subject. It only remains to pevelope an idea which, when once proved to meet all requirements, it is the duty of the Government to compel by law, owners, to carry aboard every sea-going vessel, coupling with such enactment the severest penalties for its evasion or or non-fulfillment.

THE HORSE DISEASE AND STREET CARS.

The continued prevalence of the horse disease in New York city has resulted not only in a great inconvenience to the mercantile portion of the population, but has virtually rendered worthless the ordinary means of public transportation. The various cars and stage lines have either ceased running altogether or send out such a reduced number of vehicles that the people prefer to walk rather than endure the discomforts of crowding and bad ventilation.

Various projects are discussed in the daily journals, for affording a means of conveyance between distant points of the city. A line of cheap steamers plying on either side of the island and touching at convenient streets is suggested, the plan to be similar to that of the penny boats on the Thames at London. The question of dummy engines has been again brought to light, and the city authorities have passed an ordinance allowing of their use on certain roads for a limited period; and under this authority, the Remington steam street car, from Ilion, N. Y., is soon to be put to work on the Bleecker street line. As to grades, curves, etc., the route of this road is one of the most difficult, and the powers of the steamer will be well tested.

It remains to be seen whether steam can be successfully used on street cars in lieu of horses. There is an abundance of genius in this country which, if it can only be brought to bear, will readily discover a solution for this problem. Can not some of the great army of inventors with whom we come in daily contact confer a lasting benefit on their fellow beings by finding a way of relieving this necessity?

BINARY ENGINES.

We publish elsewhere a letter from Mr. Ellis, the inventor of the improved Binary or Bisulphide of Carbon engine, heretofore illustrated in the SCIENTIFIC AMERICAN. From this, it appears that Mr. Corliss, the famous engine builder of Providence, R. I., has become so far interested in the matter, that he is about to undertake a comparative test of the new invention on a large scale, for the express purpose of determining its economy, if any, over the best forms of the steam engine. We shall look for the reports of the result with great interest.

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SUNDAY RAILWAY TRAINS.

The Brotherhood of Locomotive Engineers, recently in session at St. Louis, adopted a resolution favoring the abolishment of all Sunday trains, and appointed a committee to confer with railway officials in all parts of the country. This movement cannot succeed. It smacks of the old "blue laws" of Connecticut, which made it a criminal offence for a man to travel on the highway on Sunday, and subjected him to grave suspicion if he was even seen to walk in his private garden.

We are earnestly in favor of securing to railway engineers the full enjoyment of at least one day's rest out of seven, and they may always count upon our hearty coöperation to that end. But we think they make fools of themselves when they resolve that nobody shall ride on Sunday, which practically is what the St. Louis convention has done. If it is right and proper for people to travel on any sort of a road on Sunday, on errands of necessity, mercy or personal benefit, it is equally right for them to travel on railroads; as such roads are expressly designed for the public service, it is the duty of railway companies to provide reasonable facilities for Sunday travel. For large communities more especially, we believe it to be morally advantageous to have special railway facilities provided on Sunday, whereby the popu'ation may be quickly carried out to the adjoining country towns, there to enjoy rest, fresh air, social interchange, and Divine service if it be desired. The best of engineers, the best of cars, and plenty of them, should be provided, and the trains should be run morning and evening, so as to afford a generous accommo dation. If our friends of the Brotherhood were to resolve that all engineers who work on Sunday should rest for two days during the week, we would heartily second the motion, and believe the plan might be realized.

The public necessities require that Sunday trains shall be run,and mails and passengers carried. It remains for such organizations as the Brotherhood to regulate the matter, in some manner reasonable and satisfactory to all concerned.

AN IMPROVEMENT WANTED.

The Board of Health of New York city recently passed an ordinance which, so far as we can learn, gives, to a corporation known as the Manhattan Odorless Excavating Company, a monopoly of the vault-cleaning and sink-emptying business of the entire city. The invention controlled by the company is an air-tight apparatus which consists of a force pump to which are attached lengths of india rubber hose, through which the contents of the vault are drawn by the action of the pump into large barrel tanks, on wheels. From the upper portion of each tank projects a pipe, leading to a furnace in which a charcoal fire is lighted. The end of the hose being placed in the vault, the pump is set working by manual labor, and a stream is drawn through the hose into the tank. The noxious gases, escaping through the pipe, are conducted through the charcoal fire where, it is claimed, they are consumed. This device appears to be covered by the patent of Louis Strauss, dated January 28, 1868, of which the claims are as follows; 1. The combination of the reservoir or receiving tank and deodorizer with a forcing engine; 2, the sliding valves of the engine constructed with cutting edges; 3, the apparatus for emptying privies as above described. The idea of cutting the soil is also embodied in another patent (dated November 2, 1869, granted to J. G. Berger, a native of Bavaria), which covers a special apparatus for the purpose, composed of steel rollers and other suitable mechanism.

It is asserted by the opponents of the system that the machine withdraws only the liquid matter, while the solid substance has to be removed by tin cans in the ordinary way. If such be the case, it is evident that, so far as it is a means of avoiding disagreeable odor, the apparatus is of no advantage. This fact has been set forth in a petition, signed by a large number of property owners, which document also remonstrates against the exorbitant rates charged by the company for work. On the other hand, the night scavengers complain bitterly against the injustice done them, as not only their business is taken away from them by the action of the authorities, but they are unable to purchase rights either to manufacture or use the above described machine.

The gist of the whole matter is that some new invention is needed: a device which shall be capable of cheaply and effectively removing the whole of the soil without creating nuisance. Such an invention would be valuable in every large community.

THE CONTRADICTIONS OF SCIENCE.

Professor Pepper, of London, recently made his first appearance in public in the United States, before the Polytechnic Section of the American Institute. The "Contradictions of Science" formed the subject of a pleasant and, at times, witty conversation—we can hardly term it a lecture—which the Professor illustrated by a few well chosen though simple experiments. Some of the "contradictions" explained were the sinking of an egg in pure water and its floating in brine; the bleaching action of chloride of lime on a solution of indigo, causing letters written in the latter to disappear, while it rendered visible some characters painted in a colorless mixture of iodide of potassium and starch; the boiling of water by certain chemicals and its freezing by others; the reaction of a solution of iodide of potassium on a solu tion of corrosive sublimate, both clear liquids which, when combined in certain proportions, throw down a scarlet precipitate of biniodide of mercury, which is caused to disappear and the mixture again made limpid by the addition of an excess of the iodide of potassium, and the well known conjuring trick of the magic bottle, which is filled with weak sulphuric acid and water. The mixture being poured into wine glasses, previously rinsed out with solutions of salts of iron, lead, etc., changes its color so as to resemble different wines, milk ink, etc.

In connection with the corrosive sublimate experiment the Professor animadverted quite strongly on the insecurity of modern chemical testimony in courts of law. He spoke of the extreme care and accuracy required in the tests on which a man's life might depend, and instanced how a chemist might be led, in applying the iodide of potassium test for the deadly corrosive sublimate, to declare that the latter was not present in his analysis, by simply adding a drop of the reagent in excess. The testimony of neither one nor of two men, however expert, should be regarded as convincing. A public officer should be appointed, whose duty it should be to select three well known chemists and require each to make separate analyses. This done, they should meet and prepare a judges' report, which should be received in evidence, and the experts themselves should be subjected to severe examination and cross examination apart from each other. Such testimony should be in favor of neither side of the case, but a simple calm exposition of the truth.

The Professor gave quite an entertaining account of the so-called fire eaters. Fire, he said, might be handled with impunity if various conditions be complied with, and, as he repeatedly remarked, "if you know how." Sometimes the skin is naturally hard, thick, and callous, so that highly heated substances may be held for some time without danger; or non-conductors might be interposed—a fact which he illustrated by covering his hand with charcoal and placing thereon a lump of red hot iron. Certain chemical substances, being applied to the skin, will, when in contact with other substances of high temperature, vaporize, forming a cushion of vapor which protects the part from injury. To prove the fact, the speaker, first dipping his hand into turpentine to cleanse the skin, and then into ether, coolly plunged it into a tank of boiling water and removed an egg. Then, as a concluding experiment, he moistened his hand with strong ammonia and dipped his fingers into molten lead, hot enough to inflame paper, and finally poured the molten metal on his palm, scattering it about as if it were quicksilver.

It would be hardly proper to criticise the entertainment as a scientific lecture, as it evidently was not intended as such, being nothing more than a pleasant chat, delivered in an off hand easy manner, which succeeded in amusing the audience for a couple of hours. Professor Pepper's *forte* is popular science, and, as he says, his main object is to awaken an interest in its study in the minds of the young by presenting the subject in its simplest and most attractive light. We noticed Professors Barnard and Morton and several other eminent scientific gentlemen in the room, all of whom seemed to enjoy Professor Pepper's gravely humorous way, of telling them the commonest truths, as much as if he had devoted the evening to the profoundest of researches and investigations.

Since the above was written, Professor Pepper has delivered two of his lectures on the subject of "Persistence of Vision," at Steinway Hall. The lectures were, perhaps, suited for general audiences, but fall below the standard which the public had expected and are accustomed to in this city. We hope, at some future period, to hear Professor Pepper under more favorable auspices, as his entertainments would have undoubtedly been much more satisfactory had he not been obliged to struggle against inexperience on the part of his assistants.

THE SAXBY AND FARMER RAILWAY SIGNALS.

The oft-repeated railway disaster due to the "open switch" is again exemplified in the Seabrook casualty on the Eastern road, which has resulted in a large loss of life and is traceable to a more than usual amount of culpable negligence. If that Utopian period ever arrives when coroners' juries will find some other verdict than "no one to blame," at such time it will probably dawn upon the railway companies that it is better economy—leaving out the question of humanity—to provide the roads with improved machinery and appliances, which will reduce the danger incurred by the negligence of employees to a minimum, than to be heavily mulcted in damages and loss of property.

We published, some time since, an article on the Saxby and Farmer Safety Switch and Signal—an apparatus devised and much used in England, being employed, in fact, on many of the leading railways. This invention, for an improved form of which two patents have lately been secured in this country, is now being introduced by the agent of the manufacturers, Mr. Joseph Dixon, of No. 260 Broadway, in this city. The device consists of a suitable lever, which not only moves the switch, but also, by a very ingenious arrangement, actuates wedge blocks which firmly and immovably lock the switch rails in position.

To the absence of this apparatus, the London *Times* editorially imputes a disastrous collision which recently took place at Kirtle Bridge, England. In practice, the switches and signals are connected in such a manner that both are actuated by a single lever, and neither can be moved alone. The above mentioned journal, quoting an official report on the accident, says: "If this system had been in operation at Kirtle Bridge, the consequence would have been that the signal man, when he saw the down line clear and set his signal at safety, would, by the same act, have locked all the points leading from cross over roads and sidings on to this line. The station master, if he wished to continue the shunting and to use the down line for the purpose, instead of pulling a lever that was ready to his hand, would have been compelled to send an order to the signal man, who, by obeying it and by the act of turning the points, would have raised his signal to danger, and would thus have stopped the coming train."

The report also states that in England, in 1871, 53 accidents out of 159, and in 1870, 60 out of 122, were caused by want of locking switches or by defective signal arrangements. In the United States, 3 casualties from misplaced switches alone occurred in the past month of September.

The railway companies cannot plead ignorance of inventions of this kind, as, both in our own columns and in those of other journals, their attention has been repeatedly called to the superior and almost absolute safety of such systems. Collisions at stations and sidings take place, in greater or less numbers, yearly, on almost every line in the country; and we confess to but little hope of seeing them cease until railway corporations see fit to introduce well tried and efficient apparatus.

CORUNDUM IN PENNSYLVANIA.

At a meeting of the Academy of Natural Sciences of Philadelphia, on October 1st, 1872, Professor Leidy remarked that he had inspected a deposit of corundum recently discovered on land owned by Mr. George Ball and others, in the vicinity of Unionville, Chester Co., Pa. The deposit promises to be one of the most extraordinary accumulations of the mineral ever discovered. Detached crystals of corundum have often been found on the surface of the ground about the locality; and, in some instances, boulders of the same material, up to several tuns in weight, have been found in the superficial drift. A company, several years since, was led to seek for the corundum in place, and for this purpose sunk a shaft in a neighboring hill of albite, but met with no success.

Mr. John Smedley, an intelligent farmer employed by the proprietors of the corundum mine, was led to its discovery in place by noticing the course of the boulders of corundum in the surface drift. Tracing these to the top of a hill, he found the important material about five feet below the surface of the ground.

The corundum deposit yet remains undisturbed; and, as now exposed to view at the bottom of a trench, it appears as the crest of a large body or vein lying between a decomposing gneiss and a white talcose schist. The vein extends west, and towards the east bends at an obtuse angle to the north east. The portion exposed is twenty or more feet in length, and averages about six feet in depth and five feet in thickness at bottom, and is estimated to contain fifty tuns. How much further the bed extends, in breadth, depth, and thickness, can only be determined by future mining. The rock on the south side of the vein is the white talcose schist above mentioned, which, on the declivity of the hill, passes into steatite and serpentine. In immediate contact with the corundum, the talcose schist assumes the appearance of the mineral recently described by Mr. I. Lea, under the name of "Lesleyite."

The corundum is not of the character of emery, but is the pure material. The masses are composed of a close aggregation of bluish gray crystals, with the intervals occupied with margarite. Some of the crystals appear to have undergone partial metamorphosis into the latter material. Some of the fissures and surfaces of the masses of corundum exhibit large and beautiful crystaline plates of margarite and, rarely, unusually fine crystals of diaspore. The corundum is of more compact texture and not so readily cleavable as the North Carolina material. The discovery of this large accumulation of corundum will prove of great service to the arts in which an exceedingly hard material is required for cutting grinding, and polishing.

PETROLEUM IN MASSACHUSETTS.

For several weeks past the town of Lee, Mass., has been agitated by the alleged discovery of an oil well in that vicinity, and from the latest accounts the good news seems to be confirmed. The Pittsfield *Sun* says that the oil excitement at South Lee still continues, together with the flow of oil from the springs near there.

Mr. Wheeler, a mineralogist, claims that this and other springs in the neighborhood that show oil are only leaks from large supplies of oil, and that coal can be found in the region. In proof of his faith in the latter statement, he is sinking a shaft on the south slope of Monument Mountain, having made 60 feet in twelve days, and has discovered an excellent quality of fire clay, suitable for the manufacture of the white fire brick which are now brought from Bennington, Vt., for use in smelting furnaces, fire places, grates, etc., although no coal has been found as yet, nor has he "struck ile."

DEATH OF HON. JOHN A. GRISWOLD.

John A. Griswold, one of the first in the ranks of American manufacturers, recently died at his residence in Troy, New York. Though for some time closely identified with both national and state politics, having been three times elected to Congress and once nominated as Governor, Mr. Griswold is perhaps better known to our readers as the owner of the great iron works of Troy. In this business he embarked in 1857, subsequently purchasing and first introducing the well known Bessemer steel process in this country. Under his managment, the business of the mills became so great as to warrant their large extension, and within the past few years to render their proprietor one of the richest iron masters in the Union.

During the war, Mr. Griswold's record passes into history as one of unswerving loyalty. Many will remember the difficulties encountered by Ericsson in the building of the first and famous Monitor. Condemned as a quite impracticable scheme by naval constructors and engineers generally, the enterprise bid fair to be abandoned for want of means to carry it to completion. Mr. Griswold, however, firmly believing in the feasibility of Ericsson's idea, supplied the necessary funds, and constructed the vessel at his own expense, taking the risk of being repaid in the event of the

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ship proving successful. The result of the conflict in Hampton Roads, and the immense loss to the country averted by the timely arrival and magnificent performances of the Monitor, are too well known to need repetition. To Mr. Griswold's liberality and patriotism, as well as to the genius of Ericsson, is due the introduction of the new system of warfare, which not only rendered such efficient assistance in the suppression of the rebellion, but which has since revolutionized the naval armaments of the world.

IMPORTANT IMPROVEMENT IN TEXTILE WEAVING.

On the first page of the present issue will be found, fully described and illustrated, a new and admirable invention destined, in our belief, to materially alter, if not revolutionize, a great and growing industry. We confidently recommend it to the examination of carpet manufacturers at home and abroad, as an object well worthy of their careful attention. Mr. James Short, the inventor, is the superintendent of the New Brunswick Carpet Works, and a gentleman of life-long experience in the carpet manufacture; so that this loom is not only the result of a remarkable inventive genius, but of arduous and continued study and repeated experiment. It is of such inventions as this that our country can well afford to be proud, as it is to them, or rather to the master minds to which their conception is due, that she owes her present position of industrial supremacy.

THE BURNING OF THE ESCURIAL.

The conflagration in the Palace of the Escurial, near Madrid by which the venerable pile nearly escaped total destruction is a sad example of the general neglect and indifference which exists in Spain regarding the use of the best known and commonest safeguards of civilization. To the disgrace of the authorities on whom the warning of two previous fires in the building was totally thrown away, there were but two fire engines in the place—none others nearer than Madrid, some miles distant—and these were wretched old fashioned affairs, worthless when most needed. Moreover, it has been discovered that the gigantic edifice was unprotected by a single lightning rod or similar appliance of any kind. With a child-like confidence worthy of a better object, implicit reliance was placed in the guardianship of some saint—probably San Lorenzo—who was compensated for his services by having his effigy placed in a wood some miles distant. As it is customary for the peasantry, both in Spain and Italy, to administer severe corporal punishment to their idols, when the latter abuse the confidence of their adorers by not meeting their very reasonable expectations, it is probable that the above mentioned statue no longer exists, as it was doubtless thrashed into powder immediately after if not before the fire was subdued. *"Cosas de España,"* the London *Times* sarcastically remarks; but if these be Spanish customs, Spain richly deserves the loss of her great palace and its countless treasures of art, though such a misfortune would be a calamity to the entire world.

Fortunately, however, and recent foreign papers bring us the intelligence, but little damage was done. The storm is described as one of unusual severity. The lightning struck the roofing in the *Patio de los Reyes* (court of the kings) and spread rapidly to the library. Assistance did not arrive from Madrid until the flames had raged for several hours, but, through good fortune, not a book, a manuscript, or a picture was injured. The Spanish Minister of Finance, in his report to the Cortes, states that the church and the palace are untouched. It is estimated that the building will cost some $200,000 to repair. The idea of a national subscription was started, but King Amadeus knocked it on the head by insisting on defraying the whole cost out of his own private purse.

This is liberal on the part of the charitable young ruler, but we think that he would be wiser if he would devote some more of his superfluous revenue to the importation of a few enterprising American inventors, and assist them in the introduction of their modern devices throughout his kingdom, so putting in practical operation the "ounce of prevention" in order that he may not find himself compelled to apply the "pound of cure" to similar disasters in the future.

INCRUSTATION OF BOILERS.

The *American Exchange and Review*, in a recent number, recurs to the well known trouble caused by incrustation of boilers. Almost all natural waters contain enough lime, salts, and other impurities, to create a crust, in the interior of the boilers, which not only impairs their efficiency by its non-conducting qualities, but, if neglected, is likely to result in serious consequences.

The editor of the *Review* states that he has taken the trouble to inquire into the merits of the Anti-Lamina patent of Josiah J. Allen, of Philadelphia, for preventing incrustation; and he pronounces the ingredients to be such as to render the composition harmless, having no corrosive or injurious effects upon the iron, which many other remedies involve, and thus the effect is purely mechanical; and, from the testimony of a large number of persons who have used Anti Lamina for many years, his impressions of its merits are most favorable.

[Correspondence of the Scientific American.]

THE GEORGIA STATE FAIR.

ATLANTA, Ga., Oct. 18th, 1872.

To-day our Fair closed. The exhibition was not so large and attractive as it was in 1870, but, while the articles were not so numerous, many of them were objects of considerable interest. Prominent among these was a steam road engine by Aveling and Porter. This is an English invention, protected by patents in this country, and is doubtless known to most of your readers. But it was something new in this region, and attracted the attention of large crowds, as it made its way up and down hill and over rough grounds, drawing half a dozen or so large wagons loaded with rock. The fact is that it seemed impossible to get a load sufficiently large to test the capacity of this more than Herculean monster, which was turned about and guided, with apparent ease, by a boy.

Another object of interest was the Chicago Farm Pump by I. F. Templeton and Sons. This was admired for its neatness, its cheapness, its easy action, its wide range of application and its durability. It will doubtless have a large sale. In the agricultural machinery department, the Improved Ingraham or California Wheat Cleaner excited the admiration of all by the perfection of its work in separating smut, cheat and all foreign admixtures from the grain. The only thing of this kind remaining, after passing through the machine a specimen of wheat full of impurities, was a little cockle, which could not be removed without wasting too much of the pure grain.

Another object of great interest was a full set of mechanic's tools, of the most beautiful finish, made entirely by I. W. Baum, who has a natural talent for mechanical work, never having served a day in a machine shop. His workmanship is certainly a marvel of skill, and well deserves the numerous prizes he has taken.

The Pocket Sewing Machine and Quilter, which is sold for the low price of $5, promises to be one of the most useful of modern labor-saving machines, and attracted much attention.

Messrs. Pellegrini and George exhibited beautiful specimens produced at their terra cotta works in this city.

The "Queen of Charts," patented in your office and exhibited by Mrs. Millwer of South Carolina, appears to be adapted to cutting out every style of ladies' and children's garments.

Messrs. Zimmerman and Carter exhibited very fine specimens of a variety of soaps, manufactured at their Excelsior Steam Factory in this city. Atlanta bids fair to become a formidable rival in this line of manufacture.

The exhibition of carriages, etc., from the houses of David McBride and A. T. Finney, of this city, was fully equal to the finest specimens from northern factories.

Upper Georgia was well represented in the fruit department by Cobb and Bartow counties. Mr. C Y. Shelman, of the latter county, exhibited a remarkably fine collection of apples, peaches, pears and quinces. There is perhaps no region better adapted to these fruits than Northern or Cherokee Georgia.

The ladies' department was, as usual, well represented by the handiwork of our fair women. But I cannot specify. I therefore content myself with this brief notice of some of the prominent objects of interest. W.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

A first class pattern maker, capable of overseeing twelve or fifteen hands, may hear of a good situation by addressing Box 533, Baltimore, Md.

Wanted—Second hand engine lathe in good order, 60 inch swing, 24 to 30 feet between centers. P. O. Box 94, Owen Sound, Ontario, Canada.

Ice Machine—See advertisement, page 316.

Gage Lathes for all kinds of handles and cabinet work. Illustrated Catalogue free. T. R. Bailey & Vail, Lockport, N. Y.

Wanted—One Steam Engine, fifteen (15) horse power; best, simplest, and most economical of fuel. Terms Cash. Address W. E. Farrell, Treas, No. 16 South Sixth Street, Philadelphia, Pa.

Save your Boilers and save Fuel. Use Thomas's Scale Dissolver. In Barrels and ½ Barrels, price 5c. per lb. Address N. Spencer Thomas, Elmira, N. Y.

Mills for Grinding Bark, Grain, Feed, Drugs, Spices, Coffee, and other Substances by Hand Power, Steam, and Horse Power. Address N. Spencer Thomas, Elmira, N. Y.

Watchmakers, attention!—A rare opportunity is offered to buy out an old established Watch and Jewelry business. For particulars, see Nov. number of "Watchmaker and Jeweler," or address Thomas Johnson, Elmira, N. Y.

A Complete Turning Lathe for amateurs or boys for $25 For circular, address J. T. Pratt & Co., 53 Fulton St., New York.

Wanted—A Gun Stocker. Address Box 250, Seneca Falls, N.Y.

Wanted—A reliable and intelligent man of good address, to Engage in a desirable and lucrative business producing from $1,500 to $5,000 per year. Address J. B. Ford & Co., New York; Boston; Chicago; or San Francisco.

Soluble Glass, Water Glass, Liquid Quartz, Silicates of Soda and Potash for Concrete Cements, Fire and Waterproofing, manufactured by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

Oxide of Manganese, highest test, from our own mines, for Steel manufacturing, Patent Dryer, Paints and Glass, at lowest prices, by L. & J. W. Feuchtwanger, 55 Cedar St., New York.

Nickel Salts, double Sulph. and Ammonia, especially manufactured for Nickel Plating, by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

One Iron Planer, planes 8 ft. long, 3 ft. square; $200 worth of Tools, used 3 months. Also, 1 heavy Hand Lathe, back geared, 20 in. swing, 10 ft. bed; $50 worth of Tools. John R. Abbe, Providence, R. I.

Four Brick Machines, Combined with Steam Power (Winn's patent), makes 40 M per day, for Sale at a bargain. Address the manufacturers, John Cooper & Co., Mount Vernon, Ohio.

Complete Water Gauge for $4. Holland & Cody, 8 Gold St.

Engine and Speed Lathes of superior quality, with hardened Steel bearings, just finished at the Washburn Shop, connected with the Technical Institute, Worcester, Mass.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th Street, New York—1202 N. 2d Street, St. Louis.

Wanted—The address of Shot Gun Barrel Manufacturers. Address Box 250, Seneca Falls, N. Y.

Large and well lighted Rooms to rent, with Steam Power for manufacturing purposes. Apply to the Allen Works, cor. of Jay and Plymouth Sts., Brooklyn, between Catherine and Bridge St. Ferries.

Ransom Syphon Condenser at Fair American Institute. "Be sure and see it."

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds John Dickinson, 64 Nassau st., N. Y.

Wanted—To purchase a small Steam Tug. Address R. F. Learned, Natchez, Miss.

For Sale, Car Wheel Press—and McKenzie Blower, in fine order. Address Mansfield Machine Works, Mansfield, Ohio.

Hand Lathes. C. F. Richardson, Athol Depot, Mass.

For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

I will Remove and prevent Scale in any Steam Boiler or make no charge. Engineer's Supplies. Geo. W. Lord, Philadelphia, Pa.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Hydraulic Jacks and Presses—Second Hand Plug Tobacco Machinery. Address E. Lyon, 470 Grand St., New York.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Steel Castings "To Pattern," from ten pounds upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N.Y.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made Colt's Armory, Hartford, Conn.

For 15 in. Swing Engine Lathes, address Star Tool Company, Providence, R. I.

Machinists; Illustrated Catalogue of all kinds of small Tools and Materials sent free. Goodnow & Wightman, 23 Cornhill, Boston, Mass

Ashcroft's Original Steam Gauge, best and cheapest in the market. Address E. H. Ashcroft, Sudbury St., Boston, Mass.

Heydrick's Traction Engine and Steam Plow, capable of ascending grades of 1 foot in 3 with perfect ease. The Patent Right for e Southern States for sale. Address W. H. H. Heydrick, Chestnut Hill, Phila.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

Wanted—Copper, Brass, Tea Lead, and Turnings from all parts of the United States and Canada. Duplaine & Reeves, 760 South Broad Street, Philadelphia, Pa.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Brown's Pipe Tongs—Manufactured exclusively by Ashcroft, Sudbury St., Boston, Mass.

American Boiler Powder Co, Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

Gear Wheels for Models. Illustrated Price List free. Also Materials of all kinds. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Windmills: Get the best. A. P. Brown & Co., 61 Park Place, N.Y.

Ashcroft's Self-Testing Steam Gauge can be tested without removing it from its position.

The Berryman Manf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro. 414 Water st. N. Y.

Better than the Best—Davis' Patent Recording Steam Gauge. Simple and cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N.J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys. &c.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From October 9 to October 17, 1872, inclusive.

BOOK SEWING MACHINE.—D. Shedd, New York city.
BRAKE.—W. B. Chapin (of Wickford, R. I.), London, England.
CHAIR.—J. Vose, Boston, Mass.
COMPRESSING BLOOMS.—S. Danks (of Cincinnati, Ohio), London, England.
ELECTROMAGNETIC CLOCK.—W. M. Davis, Cincinnati, Ohio.
MUFF.—T. A. Dodge, Boston, Mass.
RAILWAY CARS, ETC.—W. D'A. Mann, Mobile, Ala.
REAMER AND COUNTERBORE.—A. Shedlock, New York city.
STEAM GENERATOR.—E. Weston, Buffalo, N. Y.
TELEGRAPH.—H. J. Rogers, New York city.
TRUSS.—C. G. Patterson, J. L. Rowe, New York city.

COPIES OF PATENTS.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with officia copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and stat name of patentee, title of invention, and date of patent.

Address Munn & Co., Patent Solicitors, 37 Park Row, New York city.

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Facts for the Ladies.—Helen Launceford, Lowell, Mass., reads by the hour while she is doing ordinary sewing with her Wheeler & Wilson Lock-Stitch Machine, and recommends it for simplicity, durability, rapidity and beauty of work. See the new Improvements and Woods' Lock-Stitch Ripper.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—What is the best solder for gun ribs and thimbles?—J. M.

2.—Can any one tell me how to make a flexible varnish for rubber, so as to give it a gloss?—W. S. T.

3.—Can any one tell me of a practical book on pruning fruit trees and shrubs?—E. E., of R., India.

4.—How is Bachhoffner's paraffin lamp constructed?—E. E., of R., India.

5.—Does any one know of a handy machine for cutting up green leaves of plants?—E. E., of R., India.

6.—Can any one give me a cheap and simple recipe for aking aerated bread?—A. T. M.

7.—Can any one give me a description of a cheap ice machine, described in the English *Lancet* a few years ago?—E. E., of R., India.

8.—How can I purify salt obtained from sea water by evaporation by the heat of the sun, and what apparatus is required?—G. W. D.

9.—Will some one please describe the preparation of senna, from the plucking of the leaves to the packing for sale?—E. E., of R., India.

10.—Is there any kind of mortar or wash which will render the brickwork of flues and hot air passages non-absorbent of heat?—A. T. M.

11.—How can I make ozone papers and how are they used?—O. S.

12.—Are Liebig's and Petitjean's processes of silvering glass for mirrors, etc., dangerous?—D. R. W.

13.—What material is generally used for bolting cloths, and what is the best for the purpose?—J. W. S.

14.—Can any one recommend any mixture more durable than linseed oil and coloring stuff for painting the floor of a room?—W. W.

15.—I am using veneers of wood, a twenty-fifth of an inch thick. How can I deprive them of taste and smell?—H. P. A.

16.—What is the best form of a light, compact, and portable dark tent or room, available either for wet or dry photo processes?—E. E., of R., India.

17.—Will some one tell me how to transfer pictures to glass, wood, china, etc., by the process called decalcomanie? Is there any publication descriptive of this process?—F. A. S.

18.—When malleable cast iron is broken, is there any way of welding (or otherwise mending it by heat), in a common blacksmith's fire, so that it will be as good and sound as it was before it was broken?—T. D.

19.—I wish to know how many square feet of pipe surface it will require, per horse power, to condense steam at sixty pounds per square inch, the pipes in the condenser being kept cool by passing sea water through them at its ordinary temperature.—J. S. B.

20.—How are engravings, etc., transferred to glass, so as not to leave anything but the printer's ink on the glass? I know the old-fashioned way of rubbing the paper on the back of the picture, but I want another and better process.—S. L. D.

21.—I am now erecting four large vats for fermenting ale, and I wish to know if there is any chemical I can apply externally to prevent them rotting. I have had great trouble with my vats, having to renew them every five years owing to the dampness of my cellar.—O. S.

22.—In the rotary engine known as Murdoch's and the several modifications of it (consisting substantially of two toothed wheels working into each other inside an elliptical case, the outer teeth working against the sides of the case and forming the pistons), is there not twice the amount of steam used that would be necessary to do the same work with an ordinary piston and cylinder having the same area of piston surface, disregarding friction, etc?—A. H.

23.—Does a point on the top of a locomotive wheel travel faster than the point of contact with the rail? I say that all points in the periphery travel at the same speed; but my friend claims that the ground is a fulcrum, and the top travels faster than the bottom, the wheel being practically a lever.—A. P. C.

24.—Will some good sawyer, who has tried all the different modes of setting the teeth of large circular saws, tell us which one will cut the most lumber the smoothest and with least power? I am using a gullet tooth saw and I swage and file square, keeping up the points of the the teeth on both sides. It does tolerably well, but I wish to know if there is a better way.—B. F. W.

25.—Will some one explain the nature of the chemical change effected by fulling raw deer skins with Straits or Labrador cod oil, by which they are converted into what is commonly known as buckskin? After the hair and grain have been removed, the skins are alternately sprinkled with the oil, fulled in a fulling stock, and aired or partially dried until the lime water in which they have been previously manipulated has entirely evaporated, and then the oil is extracted and they are ready for use.—V. E., Jr.

26.—How can I bleach broom corn so as to make it almost white?—T. J. S.

27.—Is there any way of composting leather chips and similar offal, to convert the same into manure?—T. J. S.

28.—I am a grower of tea and wish to know how to test my daily manufacture for strength, flavor, pungency and briskness when good, and for sourness, flatness, and mustiness when bad. If a chemical test is suggested, I should like to know what apparatus is required, and how it is used. Can any instrument such as an hydrometer be used? Can an extract of tea, similar to the well known extract of coffee, be made? How is it done, and what apparatus is required? What principles does tea contain, and how are they acted upon in the treatment of the leaves? Can the infusion of tea be analyzed and its constituents separated?—E. E., of R., India.

29.—Can any one tell me how blue and red litmus test papers for acids and alkalies, are prepared?—J. F. S.

30.—I am in a bad predicament and want advice. I built a cottage in the Swiss style last winter. The roofs are steep, irregular, and many-sided. Being a novice in building, I left the matter, except paying the bills, entirely to the architect. The tenant has complained from the first that the roof leaked badly all over. I find on examination that the shingles (cedar) are nailed to narrow lath-like strips instead of to boards. I interviewed a carpenter the other day, and sought his advice as to the best mode of stopping these leaks. I was dismayed when he told me the only way was to take off the shingles and slats, fasten boards to the rafters, and nail the shingles to the boards. My attention was called to rays of light streaming through the roof in all directions; and, to render me still more unhappy, my carpenter tells me that, at the first winter's storm we have, the chambers will be filled with snow, blown through these cracks and under the warped shingles. Now I do not wish to incur the expense of taking off the shingles or disfiguring the roof, by covering it with painted canvas, which some one has suggested. Is there any coating that can be supplied, which will sufficiently cover the cracks and fill the space under the shingles, to prevent the snow entering: or what can I do?—M.D.O., of N.J.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

Young Engineer, who wants to know about the dimensions of safety valves, rods, lap, etc., may study Bourne's "Catechism of the Steam Engine," or consult back volumes of the SCIENTIFIC AMERICAN. We cannot spare the space to go over the A. B. C.'s of the subject with him. If he is in real earnest to supply himself with a knowledge of the steam engine, he should, in addition to study, make himself an operating wooden model of valves, piston, and cylinder. By observing the motions of the parts, in connection with his studies, he will reach an understanding of the matter.

J. H. L. asks:—What preparation is used by painters to cover the glass in doors, to prevent people looking in, which does not materially obstruct the light? Answer: A strong solution, in water, of sulphate of zinc is frequently employed. It gives a white frosting. After drying, it should be protected by a coat of varnish.

G. A. F., of Texas, says:—I have in my house a reservoir, in the garret, for supplying the house with water. This reservoir is of wood lined with galvanized iron; pipes of galvanized iron lead from it to the washstands, etc., in the different rooms. The water is discharged from the washstands through iron pipes into a sewer under the house, leading into an open ditch some fifty yards off. The water is pumped into the reservoir from a (drive) well some thirty feet from the house and some forty feet deep. The pump is at the well; and the water is forced from it to the reservoir through galvanized iron pipes laid underground to the house, then up between the weatherboarding and ceiling to the reservoir. The water is good but, I think, has some lime and sulphur in it. Will the galvanized iron in any way affect the water and make it unwholesome to use, or is the arrangement safe? Again, is it safe on account of lightning? The iron and water are good conductors; and the reservoir being at the top of the house all the pipes lead from it to the different rooms, as well as to the pump (which is all, even the handle, of iron), and into the ground. Is it dangerous or is it a protection? Answer: The use of galvanized iron pipes for conducting water for household purposes is unsafe, as the zinc is likely to become slowly dissolved in the water and result in poisoning. Several distressing examples of such poisoning, in families, have occurred, accounts of which we have published. Your arrangement of pipes and water tank is good as a protection against lightning. All house pipes should be connected with underground pipes in the way you have them.

H. M. asks whether the heating of impure air purifies it; or, in other words, is a vitiated air, such as is generally found in ordinary cellars, rendered fit for breathing by being heated in the ordinary hot air furnaces at present in use? My reason for asking this question (which possibly may be a very absurd one) is that, being engaged in fitting up various kinds of heating furnaces, I have frequently hesitated about drawing my supply of cold air from the cellar, although it is a very prevalent custom. Answer: It does not purify foul air to warm it. It is the worst possible plan to send the air from the cellar through the heater, thence into the apartments of the house. Cellar air is apt to be charged with carbonic acid gas and other impurities. You should always arrange air pipes in connection with the heater so as to take the supply from out-doors.

H. W. S. asks:—Can you give me any method for filtering sperm oil that has become mixed with other substances? Answer: Bone black is a good material for an oil filter.

A. C. G. asks:—Is there any process by which charred paper can be restored so as to take from it its peculiar brittleness and make it bear handling? I have a valuable work, parts of which have become brittle by fire, so that it will not bear handling without breaking. The authorities at Chicago used, I believe, some method for restoring currency, etc.; can you tell what it was? Perhaps some of your correspondents may be able to enlighten me. What colored glass for lamp chimneys or shades is most beneficial for weak eyes? They are made in various tints of blue, green, red, etc.; which of them is the best, or would an occasional change from one to the other be desirable? Answer: We call to mind no method of rendering charred paper pliable, as you suggest. Use pale blue glass for the lamp chimney. It corrects the yellow glare of the ordinary lamp flame.

J. C. says:—I wish to know if there is any chemical process for getting gold out of quartz rock besides the use of quicksilver. Answer: Yes. The quartz may be dissolved in hydrochloric acid. But this is a rather expensive process.

G. R. E., of Miss., says:—I have found a pearl growing in this part of our country. Enclosed you will find a specimen; please inform me what you think of its value. Answer: The specimen is not pearl but quartz. Will G. R. E. state where he found it, that is, whether in a river bed or in dry earth; and state also the original shape of the specimen? This specimen appears to have been artificially rounded when found.

P. H. A. asks:—Is there any danger of bursting the barrel of a rifle in case the ball is not rammed down to the powder? Answer: The fact that the ball is not rammed down does not increase the liability of bursting the barrel.

D. G. N., of Ark., says:—I have a 12 horse power engine and wish to run a circular mill. Please to give me your opinion as to the best mode of obtaining full effect, also probable amount of work that will be done. If with a 20 horse power and 52 inch saw and good head blocks 9,000 feet could be cut, can I cut 3,000 or 4,000 feet? I also send a sample of scale from boiler, and sediment deposited from water. Would like to know if it is injurious. My engine is a Wood, Faber & Morse portable. Answer:—Our correspondent should probably run his saw at a velocity of periphery something under 9,000 feet per minute, taking as coarse a feed as his power will allow. He will probably be able to cut between 4,000 and 5,000 feet with careful management. If he can belt direct to the saw, without countershaft, he will probably economize power to some extent. The scale sent is injurious, as is every kind of deposit, as an obstruction to the passage of heat from the furnace gases into the boiler. That which seems almost an impalpable powder greatly resembles a form which has caused more than one explosion by the great non-conducting power which it possesses. He should clean his boilers frequently, if it is deposited in any considerable amount.

J. M., Jr., of Sydney, New South Wales, asks:—What is the best method of making lubricating oil from crude petroleum, and also from the heavy oil obtained from crude petroleum, after extraction of the paraffin scales? Answer: In some of the Pennsylvania refineries, about 50 per cent of the oil is distilled off for illuminating purposes, and lubricating oil is made by refining the residue. This is done by heating (preferably by immersed steam pipes) to 212° Fah., which drives off the lighter inflammable portions. There is left in many oils a species of grit, said to be rottenstone in solution, and there are processes for getting rid of this ingredient, but they are generally kept secret by their proprietors.

E. A., of New Mexico, sends us a mineral specimen and says:—Will you please inform me what the specimen is, and if of any value? Answer: It is oxide of manganese, an ore of considerable value in the arts.

S. asks if the rays of the moon, falling upon drops of rain, would produce a rainbow. Answer: Yes. The lunar rainbow has been frequently observed.

To J. S. J., page 217. According to experiments with hollow side stays one fiftieth of the grate area, 190 feet of air were passed through firebox for each pound of coal consumed.—C. M. H., of Iowa.

J. M. can temper his millstone picks by using the following pickle: One ounce corrosive sublimate and two handfuls common salt to six quarts water. Heat the picks to a cherry red only, and put them in the pickle, and do not draw any temper. Always work mill picks at as low a heat as possible.—J. T. N., of N. Y.

W. W. can fix pencil marks on paper as follows: Make a size of isinglass dissolved in a saturated solution of alum, boil it after cooling, and add an equal quantity of alcohol. Put the liquid in a dish, and gently immerse the drawing therein, face downwards.—J. T. N., of N. Y.

To P., query 10, page 249.—Take a wide-mouthed fruit jar (a self-sealer, whose top screws on, is the handiest) and in the bottom put an ounce of cyanide of potassinm in chunks, and over it place some cotton or wool. Cut a piece of pasteboard to the right size to fit closely the inside of the jar; punch it full of pin holes, and place it in the jar over the cotton and press it down level. Never leave the jar open long at a time as the fumes of cyanide are poisonous; and when opened, let it be done in the open air, or, if in a room, near an open window. In a jar so fixed, any insect may be killed without injuring it in the least.—L. Q. B., of O.

IRON RUST STAINS.—I have enjoyed a laugh at R. O. W.'s witticism, and would ask him if he has tried my mode for removing iron rust stains? I venture to say he has not; he therefore exposes his own ignorance, for the plan will not destroy the cloth; and if he will work cloth in one part sulphuric acid and two parts water for half an hour, he will find it uninjured by the acid. Does he know that such a solution is in daily use in a certain manufacture of cotton? I will enlighten R. O. W. further: sulphuric acid is much better than oxalic.—E. H. H., of Mass.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

ROAD SCRAPER.—Michael M. Brunner, of Orange, N. J.—The object of this invention is to provide a convenient machine for scraping and leveling roads, more especially designed for carriage roads in cemeteries and private grounds, but applicable to all roadways: and it consists in a series of adjustable bars with triangular scrapers thereon. The scraping teeth may be made separate and be attached to the bars by means of screws or otherwise, if desired. When the machine is in use these ends rest upon the ground, and as the machine is drawn along, they scrape the ground and tear up the grass and weeds. When they meet an obstruction (a fast stone for instance), their angle, in regard to the surface of the ground, is such that an obstructed bar will be raised by the contact and will pass over the obstruction and instantly drop by its own gravity to the surface of the road. The scrapers are so spread at the bottom that, although the bars are separated, the scraping teeth cover the entire surface, and leave the ground level and clean when they are not obstructed by roots or stones. Weights on the rear ends of the bars may be adjusted as desired. Each bar may have a weight, and, as they are moved from or toward the scrapers, the effect will be increased or diminished. The machine is in use in the grounds of the cemetery at Orange, N. J. and is spoken of as working in the most satisfactory manner.

BOTTLE.—Benjamin C. Odell, of Kingston, assignor to himself and Robert McNaught, of Albany, N. Y.—This invention relates to a new style of bottle for use in the dispensing of medicaments and other articles; and has for its object to separate within the same bottle two or more kinds of liquid which can be separately removed to be mixed or not, as may be found most agreeable or proper. The invention consists in arranging one or more partitions within the bottle, thus dividing it into two or more separate vessels or receptacles, each of which has its own discharge neck or spout. This enables the putting up of several ingredients whose mixture in the same bottle may not be required, but which, nevertheless, it is desirable to have at hand together.

DEVICE FOR CUTTING SCREWS.—William W. P. Clement, of Canoe Station Ala.—This invention relates to a new implement for cutting screw threads on bolts or pins, being especially intended for use on the ends of bolts that project from cylinder heads or other surfaces, from which it is not desired to detach the bolts. The invention consists in the use of dies, held by hinged jaws and by a clamping nut in the end of a tubular shank, which can be connected with a brace or wrench whereby to be turned. This instrument can be applied without inconvenience in places which are inaccessible to the ordinary screw plate.

GLOVE.—George Chandt, of Port Jervis, N. Y.—This invention consists in the form of the pattern or shape for the thumb piece, whereby a smooth fit in the angle between the hand and thumb is produced, and the seam is removed from the part most subject to wear; and second, it consists of a flap attachment to one of the parts at the opening in the wrist, adapted to wrap around and button at the front of the wrist.

MODE OF ATTACHING PULLEYS AND WHEELS TO SHAFTING.—Charles L. Smith, of Rahway, N. J.—This invention has for its object to furnish an improved device for attaching pulleys and wheels to shafts securely, and at the same time detachably. In the hub of the pulley is formed a groove, which does not extend the whole length of said hub, and which is designed to receive a key rigidly attached to the shaft upon which the pulley is placed. In the end of the hub of the pulley, at the end of the groove, is formed a dovetailed notch, into which is fitted a dovetailed piece. Upon the outer surface of the end of the pulley hub and of the piece is formed a screw thread, into which fits the screw thread of the nut or band. By this construction the dovetailed piece prevents the tongue from coming out of the groove, and the band or nut prevents the piece from coming out of the notch, so that the pulley is rigidly and at the same time detachably connected with its shaft.

HORSE POWER.—Thomas S. Johnson, of Winona, Miss.—This invention relates to a new manner of connecting the driving wheel of a horse power with the sweeps to which the animals are attached, and has for its object by the new connection, to increase the convenience of construction and gain or economize power. Sweeps secured in a socketed hub on a shaft so as to project from the diametrically opposite sides thereof, and connected by inclined braces with the driving wheel, constitute the claims allowed in the patent.

WASHING MACHINE.—Joseph H. Jenkins, of Smithville, Mo., assignor to himself and Elijah W. Jenkins, of same place.—This invention has for its object to furnish an improved washing machine, and it consists in the box

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which is made rectangular in form and contains a large cylinder, to the face of which are attached, at a little distance from each other, longitudinal ribs, which are turned into alternate concavities and convexities, and which should be so arranged that the convexities of one rib may be opposite the concavities of the adjacent ribs, so as to more effectively operate upon the clothes and so as to allow buttons to pass the said ribs without being broken off. The operator, by operating the treadle with his foot, can bring a concave board against the ribbed cylinder and hold it there with any desired force. A flexible pad of cloth, or other suitable material, may be placed upon the concave board to form a yielding bed for the clothes while being operated upon by the ribbed cylinder.

ROTARY WRENCH.—Almon Pitcher, Freedom, Minn., assignor of one half his right to Lester D. Pitcher, Dixon, Ill.—This invention consists in an improved mode of opening and closing the two pawls which are used in turning the jaws of a rotary wrench. The disengaged pawl is held by a dog, while a spiral spring holds the other pawl to its work.

LOOM FOR WEAVING HAIR CLOTH.—William Samuel Laycock, Sheffield, England.—This invention is applicable to those looms in which the weft is of horse hair, or other material in short lengths; and it consists in the application of certain parts to the shuttle, which parts catch hold of the weft and deposit it in the shed. When the shuttle, in transversing, brings one of the rollers near the selected horse hair, it is guided into the groove of the roller by the guard and curved wire, and as the traverse of the shuttle continues while the end of the selected horse hair is held in the nippers, it is evident that the shuttle draws the horse hair out of its bunch in the tube and deposits it in the shed, the nippers of the right hand selector being opened as soon as the shuttle has arrived near the left hand selector to release the horse hair. A left hand selector, as soon as the shuttle has passed, is raised to lift the end of a horse hair, and to hold it while the shuttle returns.

MANUFACTURE OF INDIA RUBBER HOSE.—Isaac B. Harris, Newtown, Conn.—This invention relates to that description of ply-hose called suction hose, heretofore manufactured of india rubber, or india rubber compounds, in combination with cotton, flax, linen, canvas, or cloth, and consists in protecting from displacement the coils of metallic wire or coils of metallic hoop iron or loose rings employed in keeping the flexible canvas and india rubber materials of such hose or tubes distended against atmospheric or other external pressure. The inventor forms the outside coverings and applies them outside of the bare or uncoated wires, hoops, or rings first, and presses them inward so as to effect the cementation thereof as heretofore, and he afterward introduces an inside covering for the metallic spirals or rings. This inside covering is formed of a plastic or yielding rubber tube, and inside of this tube, when introduced into the hose, he applies hydraulic, gaseous, or steam pressure. By this means, the inner tube is forced outward against the wires, hoops, or rings, and also against the surface of their immediate outside covering, there being no filling inserted as heretofore (in the making of ply-hose) between the coils of wire.

FIREPLACE DAMPER.—James Bradford, Charlotte, N. C.—This invention has for its object to furnish an improved device for regulating the draft of fireplaces, which shall be so constructed and arranged as to supply the fireplace with air to support combustion from outside the room. In the foundation is formed a transverse flue, open at both ends, and from which small flues lead up to an air chamber, placed directly beneath the hearth, and which should occupy the space of about two bricks, more or less. The air chamber is covered with a metallic plate, which should be so formed as to rise a little above the level of the hearth, and in its vertical forward side, near the top, is formed an opening through which the air may be allowed to escape. Another plate fits upon the top of the forward part of the plate above mentioned, and the forward edge, which is bent downward, is so arranged as to allow the air to escape through the opening to the fireplace to support combustion, and thus prevent air from being drawn from the room for that purpose. Cold air may be prevented from being drawn in through the cracks and openings around the doors and windows of the room. This construction of the device prevents any puff of air from passing through the flues and air chamber to the fireplace, and prevents any cinders or ashes from falling into the air chamber or flues.

BOAT-DETACHING APPARATUS.—Edward J. Hill, Pimlico, England.—This invention relates to improved means of automatically detaching a ship's boat immediately it is lowered into the water. In carrying out the invention, a peculiar contrivance, which may be divided into two parts, termed the slip hook and the slip ring, respectively, is employed. This contrivance the chief means whereby the automatic detachment of the boat is insured. It is combined with the boat and boat-lowering tackle. The boat-lowering tackle may be of any suitable description. The boat is suspended from the block tackle by means of an arrangement of ropes or chains, termed a sling, the purpose of the said sling being to connect the slip rings together. The slip hooks and the slip rings are employed, one toward either end of the boat. Each slip ring is made double—that is to say, it is forged in two loops at right angles to one another. The smaller loop is attached to the nearest block of the tackle, and the large loop is sometimes made heavier on one side, for the purpose of insuring the disconnection of the boat under certain circumstances. The sling consists of a wire rope, by which the two lower blocks of the falls are connected together, and two short chains, which may commonly be of the length of two feet, by which the slip rings are attached to their respective blocks. The length of the horizontal rope is less than the distance between the slip hooks fixed in the boat, so that when the slip rings are engaged in the slip hooks, and the boat is suspended, the chains each stretch out at an angle with the rope. The ends of rope are merely hooked to the blocks by hooks formed on the under side of the first link or shackle of chains, a loop being made at each end of rope around a thimble fitting loosely on hooks, so that, when the slip rings disconnect from the slip hooks, the rope will be detached from the blocks and fall into the boat, thereby avoiding any chance of the rope dragging a man overboard. The slip hooks are pivoted in a shackle or link, and are free to incline themselves to the direction of the strain. The slip hook consists of a curved or hook shaped part, in which the slip ring engages, and an upright guard, over which the slip ring is passed. The guard serves to render it impossible for the slip ring to again engage itself with the hook, when once, by the slackening of the chains, it has become detached. Thus, immediately the boat is fairly floated and the sling chains are released from its weight, they slacken and allow the slip rings to fall, whereby the boat is instantaneously and automatically detached by the act of lowering the boat into the water.

NEW BOOKS AND PUBLICATIONS.

COOLEY'S CYCLOPÆDIA OF PRACTICAL RECEIPTS, and Collateral Information in the Arts, Manufactures, Professions and Trades. Fifth Edition. Revised and partly rewritten by Richard V. Tuson, F. C. S. Philadelphia: Lindsay & Blakiston.

This new edition of a well known work contains information, on all the subjects on which it treats, of the latest date, and describes the most recent improvements in all branches of domestic and commercial economy.

TABLES, for the Rapid and Exact Computation of the Number of Gallons contained in any Given Weight of Oil, etc., arranged with Special Reference to the Wants of the Petroleum Trade. By S. A. Lattimore, A.M., Professor of Chemistry in the University of Rochester, N. Y.

This book is a handy volume of comparative weights and measures of oils of all specific gravities. It will be found useful to the trade, as it is complete and trustworthy.

SMALL POX; the Predisposing Conditions and their Preventives, with a Scientific Exposition of Vaccination. By Dr. Carl Both. Boston: Alexander Moore. Boston and New York: Lee and Shepard.

Dr. Both gives, in this book, a lucid and, no doubt, a correct explanation of the condition of the body and blood which renders man especially accessible to the attacks of the terrible scourge, small pox; but he attacks the system of vaccination in its entirety, without attempting to explain away the fact that the ravages of the disease have been largely reduced wherever the practice of vaccination has been thoroughly enforced by law. Many writers on this subject have shown that cleanliness, temperate living, and proper care of the health will, in theory, prevent the spread of the disease; but we have to deal with society as it is, with dirt, squalor, intemperance and neglect of decency all around us; and the efficacy and necessity of vaccination are demonstrated more and more forcibly every day.

EVENINGS AT HOME: A Collection of Indoor Games. Milton Bradley & Co., Springfield, Mass.

Messrs. Milton Bradley & Co. are largely engaged in the manufacture of games for children, calculated to form pleasant and useful amusement during the long winter evenings. We notice that, in this collection, the excellent kindergarten system of object teaching has been followed as a principle, while the various playthings are admirably devised to combine both instruction and entertainment. Each game (and a large selection, through the courtesy of the manufacturers, has been laid before us) has some useful object. Thus, for children of two or three years of age, there are bits of gaily tinted paper, to weave into fanciful designs, thus impressing their minds with the first ideas of color and form. Then there are games which teach the names of numbers; others, more advanced, that require some arithmetical knowledge to perform the mental computation; others, again, such as the "dissected locomotive," give a good general idea of the parts of machinery. Even literature is pressed into service, for a game of cards is published by which the juveniles are rendered familiar with the prominent characters of Dickens' novels. History is taught in a somewhat similar manner; while even the alphabet is presented in such an attractive form that the most perverse of youngsters would, of his own free will, take the first steps in the thorny path of learning. Nothing is published by the above firm that will offend the most fastidious. Every thing is either innocently amusing or directly instructive, while the sole aim is to provide healthy and profitable recreation. From our examination of the samples forwarded we can cordially recommend the games to the notice of our readers as excellent gifts for the little ones during the coming holidays.

UNDERGROUND TREASURES: How and Where to Find Them. By James Orton, A.M., Professor of Natural History in Vassar College, N. Y. Worthington, Dustin & Co., Publishers, Hartford, Conn. Price $1.50.

This is the title of a valuable little work on minerals, etc., by Professor James Orton, of Vassar College. It is intended as a guide for the most unscientific, enabling them to determine the nature of the majority of mineral specimens themselves. By an artificial key, prepared by the author, the use of the plain language of common sense, and the omission of any thing and every thing which will not aid in distinguishing the various minerals, the necessary knowledge has been condensed into a very small compass. With this little book in hand, any one may detect the useful minerals without trouble or expense. It will prove of great value to many, especially in remote districts of our country, and lead to the development of the vast but now hidden mineral resources of the United States. It is thoroughly scientific, without appearing so. It is not meant for the mineralogist, but for the artisan, the farmer, the laborer, the miner, and the like. It will be welcomed by the majority of our readers, being just what is needed to place in the hands of the people; and its use, we think, will result in many discoveries.

[OFFICIAL.]

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for which Letters Patent of the United States were granted

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On each Trade-Mark	$25
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,635.—TOOL HOLDER.—W. W. Draper. January 2, 1873.
22,681.—COOKING STOVE.—P. P. Stewart. January 2, 1873.
22,723.—LANTERN.—C. Gersten. January 8, 1873.
22,742.—BED BOTTOM.—B. F. S. Monroe. January 8, 1873.
22,753.—BREECH LOADING FIRE ARMS.—C. Sharps. January 8, 1873.
22,812.—ROLLING HORSESHOE IRON.—W. W. Lewis. January 15, 1873.
22,833.—SEWING MACHINE.—W. W. Wade. January 15, 1873.

EXTENSIONS GRANTED.

1, 829.—PHOTOGRAPHIC SHIELD.—E. Gordon.
21,879.—SELF MOUSING HOOK.—J. R. Henshaw.

DESIGNS PATENTED.

6,201.—WATCH CASE.—C. K. Colby, New York city.
,202.—STOVE PLATFORM OR SUPPORT.—W. M. Conger, Newark, N. J.
6,203.—TOY BOAT.—J. M. Dodge, Newark, N. J.
6,204.—STAIR ROD.—W. T. Mersereau, Orange, N. J.
6,205.—HANDLES OF SPOONS, ETC.—E. C. Moore, Yonkers, N. Y.
6,206.—SUGAR TONGS.—G. Pashley, E. Davies, New York city.
6,207.—GROUP OF STATUARY.—J. Rogers, New York city.
6,208.—JARS FOR FISH, ETC.—J. R. Thompson, New York city.
6,209.—LADY'S HOOD.—C. E. White, Baltimore, Md.

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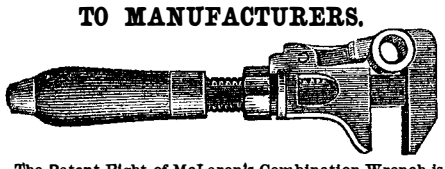

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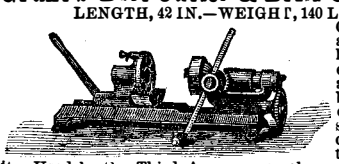

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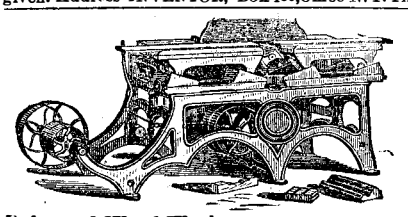

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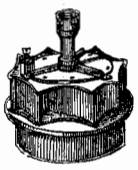

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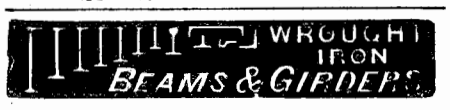

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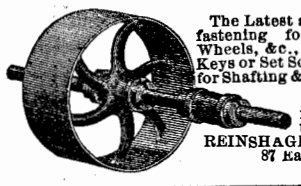

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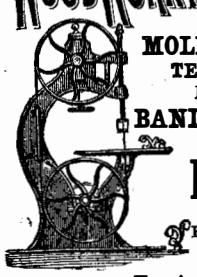

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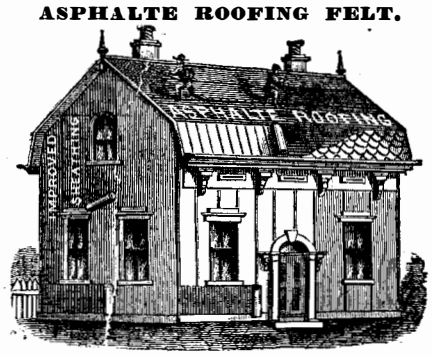

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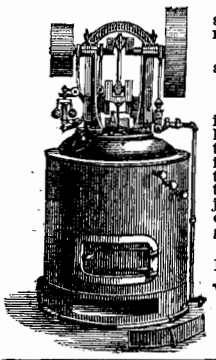

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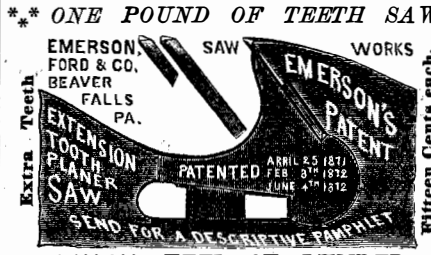
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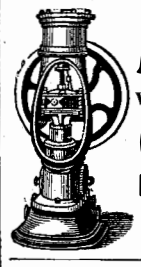

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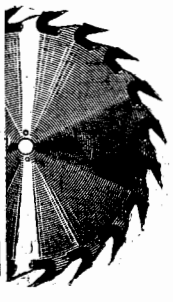

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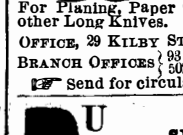

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